

Military & Aerospace Electronics®

FEBRUARY 2010 • VOL. 21 NO. 2

THE MAGAZINE OF TRANSFORMATION IN ELECTRONIC AND OPTICAL TECHNOLOGY

MEMS and nanotechnology

Nanotechnology and micro-electromechanical systems, once only fodder for science fiction, have reached a new milestone. **PAGE 21**

Embedded microprocessors

Advantage in the microprocessor battle for military embedded computing may be shifting from Freescale Semiconductor to Intel Corp. **PAGE 30**



FIRST ROUND accuracy

Electro-optics
for special forces

page 15





POWER BY DESIGN

Custom power solutions designed to fit your specific needs

Vicor Custom Power: Small company responsiveness, large company resources

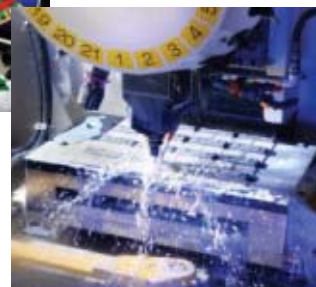
The sole focus of Vicor Custom Power is designing and manufacturing turnkey custom power systems that meet your specific needs. Vicor Custom Power maintains the flexibility of a small entrepreneurial company while taking advantage of Vicors technical and business resources to deal effectively with your most challenging power requirements. Vicor has invested in the tools and resources to offer you full service solutions from prototype to mass production with the shortest lead times and the lowest risk.

General Capabilities:

- Electrical and Mechanical Design
- Rapid Prototyping
- High Volume Production Capacity
- MIL-STDs Compliance
- Reliability / Certification Testing:

High Temperature Operational Life
HALT (Highly Accelerated Life Test)
Mechanical / Thermal Shock
Vibration
Humidity
Acceleration

Altitude
Explosive Atmosphere
Temperature Cycling
Burn In
EMI
Transient Immunity



Put Vicor Custom Power to work for you today, call 1-800-496-5570 to speak with a Vicor Custom Power engineer, or email apps@vicorcustom.com

vicorcustom.com

VICOR CUSTOM
POWER



THE ENEMY IS THE WORKPLACE.

There are conditions under which a less-than-rugged server doesn't stand a chance. Extreme cold. Heat. Rough terrain. Weather of every kind. To defeat this enemy, DRS delivers lightweight rugged servers, fully tested and field proven to withstand harsh battlefield conditions. 24-7.

In the field, powerful and reliable servers are a necessity to process critical information. But harsh field conditions – rough handling, heat, cold, moisture and dust – can easily cause equipment failures. The solution: DRS V1 Plus Rugged Servers. Designed with a high performance to weight ratio, these servers are MIL-STD-810F qualified to withstand harsh conditions that would destroy commercial-grade servers. Bring us your toughest challenges. We're always looking for new enemies to conquer.

www.drs.com/servers



A Finmeccanica Company

Migrating to OpenVPX

OpenVPX NOW



Ascend to higher levels of performance and interoperability

Migrate your performance away from a proprietary, closed architecture to flexible open solutions. Ensemble™ Series OpenVPX™ 3U/6U solutions are scalable from simple switchless to complex configurations using board types such as SBCs, switch and I/O modules, and HCD boards.

Why OpenVPX

- Interoperability ensures scalable, flexible solutions
- Migration with Mercury maintains high performance
- Mercury leadership kick-starts open standards
- Extensive product line deployed and available today



Visit www.mc.com/openvpxnow

Copyright © 2010 Mercury Computer Systems, Inc. Ensemble is a trademark of Mercury Computer Systems, Inc. and OpenVPX is a trademark of VITA.

FEBRUARY 2010 • VOLUME 21, NUMBER 2

» CONTENTS

4 TRENDS

6 NEWS

6 IN BRIEF

15 SPECIAL REPORT

First round accuracy

Special forces operators demand their electro-optic equipment—laser designators, laser sites, thermal imagers, night-vision goggles—be low power, light weight, rapidly deployed, and deadly accurate.



21 TECHNOLOGY FOCUS

A sea change in small electronics

Miniaturized electronics are leaving the labs, entering production, and being integrated into military and aerospace system designs.



27 OPINION

30 PRODUCT INTELLIGENCE

High-end military embedded microprocessor applications are beginning a shift to Intel



32 ELECTRO-OPTICS WATCH

42 PRODUCT APPLICATIONS

44 NEW PRODUCTS

48 MILAERO.COM



» ON THE COVER



Special forces—whether Army Rangers or Green Berets, Delta Force, or Navy Seals—depend on technology that gives them first-shot accuracy, whether it is lasing a target for unmanned aircraft or killing the enemy with one shot from a rifle. Their laser rangefinders during the early days of the conflicts in Afghanistan amazed warlords as operators would mark a target with their laser designator, then within minutes Navy aircraft or armed unmanned aerial vehicles (UAVs) would destroy it. **Page 15**

Rad Tolerant HiRel DC-DC Converters

M3L SERIES



M3L-Series

- ✓ 3.3 to 30V DC Output
- ✓ Up to 25W Output Power
- ✓ 16 to 50V DC Input
- ✓ Efficiency up to 80%
- ✓ Single, Dual
- ✓ TID up to 25 krad(Si)
- ✓ SEE up to 37 MeV.cm²/mg

For more information call
1.800.981.8699 or visit
<http://hirel.ior.com>

International
IOR Rectifier

THE POWER MANAGEMENT LEADER

Intel i7 microprocessor set to produce tectonic shift in industry



By **JOHN KELLER**
EDITOR IN CHIEF

The military embedded computer industry has been turning backflips since last month amidst the excitement surrounding the 7 Jan. introduction by microprocessor giant Intel Corp. of the latest versions of its Core i7, i5, and i3 processors at the International Consumer Electronics Show in Las Vegas.

Although several of Intel's powerful new microprocessors are based on the company's 32-nanometer submicron processing technology, what has the military computer board industry excited most is the floating-point processing capability of the i7 device. It's interesting to note that Intel is incorporating floating-point processing in its latest processors for reasons that have little, if anything, to do with embedded processing for aerospace and defense applications.

Intel and its customers are attracted to floating-point capability to help power new generations of desktop computers; floating-point processing helps desktop and laptop computers handle video faster and more efficiently than ever before. It's difficult to surf the Internet today without being prodded to view some kind of video, and it is becoming common for personal computer users to stream movie-length videos to their machines. Floating-point processing helps make that happen.

It's not video capability that is of interest to the military embedded computing community. Systems designers and single-board computer makers in this space see floating point and think digital signal processing (DSP) to crunch the complex and fast-moving data streams from radar, sonar, electronic warfare, and signals intelligence systems.

While stand-alone DSP chips have existed for years, systems designers would rather use processors able to perform DSP as well as general-purpose processing on a single chip. This approach not only helps shrink

substantial processing capability into small spaces, but it also helps defense systems designers benefit from the price and reliability advantages that come from the massive scale of manufacturing that Intel will see in its newest desktop microprocessors.

It's funny that Intel sees the floating-point capability of its Core i7 processor as the gateway to a new generation of complex graphics and fast streaming video, while military systems designers see it as the latest and greatest way to implement signal processing for electronic and electro-optical applications with commercial off-the-shelf (COTS) single-board computers.

Within hours of Intel's introduction of the Core i7 processor and the other chips in the company's new Core family, embedded computing heavyweights Curtiss-Wright Controls Embedded Computing in Leesburg, Va., GE Intelligent Platforms in Charlottesville, Va., and Extreme Engineering Solutions Inc. of Middleton, Wis., had introduced embedded computers based on the Intel Core i7. Companies like Advantech and ADLINK soon followed, and more Core i7 embedded products are expected.

In the grand microprocessor wars that have been entertaining the military embedded computing industry now for nearly 30 years, it is becoming clear that a tectonic shift is in progress that could swing preferences for high-performance embedded DSP computing power—which now revolve around the Freescale Semiconductor Power Architecture—back into Intel's camp.

While Intel is out of the gate with big momentum for its Core i7 devices, Freescale has a lot of catching up to do. The company disappointed many military systems integrators when it abandoned the AltiVec floating-point capability in its latest microprocessors.

It remains to be seen in the coming weeks just how big a deal this shift in the microprocessor industry will be. With the likes of Curtiss-Wright, GE, and Extreme Engineering on board, it's bound to be significant for the military embedded industry. ●

SENIOR VICE PRESIDENT, GROUP PUBLISHER

CHRISTINE SHAW
TEL (603) 891-9178 • cshaw@pennwell.com

EDITOR-IN-CHIEF JOHN KELLER

TEL (603) 891-9117 • FAX (603) 891-9146
jkeller@pennwell.com

EXECUTIVE EDITOR JOHN McHALE

TEL (603) 891-9119 • FAX (603) 891-9146
jmchale@pennwell.com

SENIOR EDITOR COURTNEY E. HOWARD

TEL/FAX (509) 587-3344 • courtney@pennwell.com

CONTRIBUTING EDITOR

WESTERN BUREAU J. R. WILSON

TEL (702) 434-3903 • FAX (702) 920-8068
jrwilson@pennwell.com

ART DIRECTOR KELLI MYLCHREEST

PRODUCTION MANAGER MARI RODRIGUEZ

SENIOR ILLUSTRATOR CHRIS HIPP

AUDIENCE DEVELOPMENT MANAGER

JAYNE SEARS-RENFER

TEL (603) 891-9416 • jaynesr@pennwell.com

AD SERVICES MANAGER MELANIE LEMONS

TEL (918) 831-9484 • admaterial@pennwell.com



EDITORIAL OFFICES

PENNWELL CORPORATION, MILITARY & AEROSPACE ELECTRONICS

98 Spit Brook Road LL-1, Nashua, NH 03062-5737
TEL (603) 891-0123 • Fax: (603) 891-0514 • www.milaero.com

SALES OFFICES

REPRINTS ANTOINETTE HIGH

TEL (717) 505-9701 • Antoinette.high@theygsgroup.com

LIST RENTAL BOB DROMGOOLE

TEL (603) 891-9128 • FAX (603) 891-9341
bobd@pennwell.com

EAST OF MISSISSIPPI PHIL DAVIS, SALES MANAGER

PennWell Publishing 106 Kenton Court, Simpsonville, SC 29681
TEL (864) 288-2290 • Cell (630) 248-5525
FAX (864) 284-9934 • phild@pennwell.com

WEST OF MISSISSIPPI JAY MENDELSON

4957 Chiles Drive, San Jose, CA 95136
TEL (408) 221-2828 • FAX (650) 941-5120
jaym@pennwell.com

MILITARY & AEROSPACE ELECTRONICS SHOW CONFERENCE & EXHIBITION GROUP

MARKETING MANAGER LUBA HRNYK

TEL (603) 891-9162 • lubah@pennwell.com

GROUP EXHIBITS SALES MANAGER JO-ANN PELLEGRINI

TEL: 650-941-3438, ext 26 • joannp@pennwell.com

CORPORATE OFFICERS

CHAIRMAN FRANK T. LAUINGER

PRESIDENT AND CEO ROBERT F. BIOLCHINI

CHIEF FINANCIAL OFFICER MARK WILMOTH

TECHNOLOGY GROUP

SENIOR VICE PRESIDENT/PUBLISHING DIRECTOR

CHRISTINE SHAW

SENIOR VICE PRESIDENT AUDIENCE DEVELOPMENT

GLORIA S. ADAMS

SUBSCRIPTION INQUIRIES

TEL (847) 559-7500 • FAX (847) 291-4816
e-mail: mae@omeda.com, web: mae-subscribe.com

MILITARY & AEROSPACE ELECTRONICS ©2010 (ISSN-1046-9079) is published monthly by PennWell Corp., 1421 S. Sheridan, Tulsa, OK 74112. Periodicals postage paid at Tulsa, OK 74101 and additional mailing offices. Editorial offices are located at 98 Spit Brook Road, Nashua, NH 03062-5737. Subscription Prices: Free to qualified subscribers in North America. Other subscribers in U.S.A \$160.00 one year, \$280.00 two years, \$410.00 three years. Other subscribers in Canada \$250.00 one year, \$430.00 two years, \$580.00 three years. All other International \$330.00 one year, \$575.00 two years, \$750.00 three years. Call (847) 559-7500 for subscription information. We make portions of our subscriber list available to carefully screened companies that offer products and services that may be important for your work. If you do not want to receive those offers and/or information, please let us know by contacting us at List Services, Military & Aerospace Electronics, 98 Spit Brook Road, Nashua, NH 03062. POSTMASTER: Send change of address form to MILITARY & AEROSPACE ELECTRONICS, PO Box 3295, Northbrook, IL 60065-3295. All rights reserved. No material may be reprinted without permission from the publisher. Back issues of Military & Aerospace electronics may be purchased at a cost of \$15.00 each in the U.S., \$20.00 Canada, and \$25.00 elsewhere. RETURN UNDELIVERABLE CANADIAN ADDRESSES TO: P.O. Box 122, Niagara Falls, ON L2E 6S4. Printed in the USA / GST NO. 126813153 / Publications Mail Agreement No. 875376



120 Watts

½ ounce, 1.1 in²

Miniature, rugged 28 Vdc MIL-COTS converters deliver breakthrough performance and flexibility



32.5 x 22.0 x 6.6 mm
1.28 x 0.87 x 0.26 in

- Wide input 28 Vdc (13.5 to 50 V)
- Isolated 1 to 50 Vdc output
- PRM 120 W, VTM up to 100 A
- High efficiency: >95% per chip
- Low noise, fast transient response
- Full MIL temperature: -55°C to 125°C operation
- MIL-STD-1275, MIL-STD-704, DO-160 and MIL-STD-461 compliance with M-FIAM7 filter

The MIL-COTS PRM™ regulator and VTM™ transformer chipset provides the smallest, highest efficiency, highest density complete DC-DC conversion for mission critical 28 Vdc military and aerospace applications.



Through hole and Thermally Enhanced options available

To order samples,
call 1-800-735-6200 (US & Canada)
or email custserv@vicor.com

All parts in mass production and available from stock.

800-735-6200

vicorpower.com/milvichip2mae



NEWS

DHS heads-up initiative to develop revolutionary homeland security technologies

By **JOHN KELLER**

WASHINGTON—The U.S. Department of Homeland Security (DHS) in Washington is asking industry for revolutionary technologies improve homeland security missions and operations.

The DHS Science & Technology Directorate is issuing a long-range broad agency announcement (DHS BAA 10-01) to develop and demonstrate homeland security technology for border and maritime security; chemical and biological division; command, control, and interoperability; explosives countermeasures; as well as human factors and behavioral sciences.

This solicitation will be open for one year, and closes on 31 Dec. 2010. Those interested may submit proposals and white papers any time during this period. Those selected will

be asked to demonstrate prototype technologies in the field.

The border, maritime, and cargo security part of this solicitation involves new surveillance, monitoring, and response capabilities for covering vast expanses of remote border territories, as well as new security devices and inspection methods for securing large volumes of cargo entering U.S. ports.

This component involves new low-power surveillance technologies, as well as handheld devices that help inspect hidden or closed compartments; non-lethal weapons to disable vehicles, ships, and aircraft; sensors to detect the origin of gunfire; decision-support technology; wide-area coastal surveillance to beyond the horizon; improved sensor technology that overcomes coastal clutter; data fusion

Continued on page 8

F-35 Joint Strike Fighter leverages COTS for avionics systems

By **JOHN McHALE**

FORT WORTH, Texas—Designers of the avionics systems for the F-35 Lightning II Joint Strike Fighter (JSF) aircraft are using commercial off-the-shelf (COTS) avionics wherever and whenever possible throughout the advanced fighter's cockpit.

"Performance, affordability, and maintainability of the platform over time are big part of why COTS is so important," says Eric Branyan, vice president and deputy program manager for the F-35 program at Lockheed Martin Aeronautics Co. in Fort Worth, Texas—systems integrator for the F-35.

COTS technology contributes to major parts of the F-35 avionics and electronic warfare capabilities,

Continued on page 8

Avionics in the F-35 cockpit, shown at right, leverage COTS technology.



IN BRIEF

Next-generation avionics for Ariane 5 launch vehicle to be provided by Astrium

The European Space Agency (ESA) selected Astrium in Paris, France for initial development of its Ariane 5 Midlife Evolution (ME) program that will integrate next-generation avionics and flight software into the spacecraft. The teams at Astrium Space Transportation are working on a new upper stage for the launch vehicle. In addition to the avionics and flight software, it will feature a new re-ignitable Vinci engine. The new upper stage for the Ariane ME will be more safe and reliable than existing equipment, company officials say. The ESA program aims to raise the payload capacity of Ariane 5 from 10 to 12 tons, Astrium officials say. The new Ariane 5 is expected to make its first commercial flight around 2017.

UAV, UGV capabilities of Brigade Combat Team Modernization Increment 1 to enter production

Boeing officials announced that Increment 1 of the U.S. Army's Brigade Combat Team Modernization program will begin low-rate initial production early in 2010 as a result of the Milestone C production review by the Defense Acquisition Board (DAB). A key element of the program will provide soldiers with enhanced intelligence, surveillance, and reconnaissance capabilities, as well as increased survivability and lethality. Initial capabilities include a small unmanned ground vehicle (UGV); a Class I unmanned air vehicle (UAV); unattended ground sensors that are multi-mode surveillance sensors for target detection, location, and classification, with an imaging capability for identification; a non-line-of-sight launch system, which is an unmanned missile system capable of extended range targeting and precision attack; and an integrated computer to host communications, radio systems, and battle command software.

NASA chooses three finalists for future space science mission to Venus, an asteroid, or the moon

NASA selected three finalists for the agency's next space mission to another planet in the solar system. The final project selected in mid-2011 may

Introducing New 1RU and Blade Servers for Mission Critical Applications.

1RU RES Servers

- One or two Intel® Xeon® quad-core CPUs
- Up to 96GB ECC SDRAM
- Up to 3 lockable and removable HDD
- Dual redundant, hot-swappable PSUs
- Dual redundant DC power option



CoolShell™ CS-3U Blade Server

- 3RU, 17.75" deep subrack
- Two Intel Xeon quad-core sockets
- Up to 64GB ECC memory
- DVD, 2 x 2.5" HDD's
- 2.5" SATA HDD option
- Seven independent 1Gb/s Enet NIC's
- Copper or Fibre interface to NICs
- Twelve independent USB ports
- Up to three Graphics GPU's
- Two hot swap 850W PSU's



**For Sun® Solaris, Linux®,
and Microsoft® Windows®
environments**

When it comes to computing in harsh environments, nobody is more at home with its surroundings than Themis Computer®. For over a decade, Themis has delivered high performance, high availability computing for the most demanding military, aerospace and communications applications.

Themis' new family of 1RU, 2RU, and 3RU Rugged Enterprise Servers™ (RES) includes the latest quad-core processors from AMD and Intel, offering ruggedized systems with the fastest, widest range of performance options and scalability.

Themis CoolShell systems combine cable management with industry leading SWAP optimization. These modularly maintainable systems have front only access for all FRU's, fans and cabling, achieving the lowest possible MTTR. Dual and quad Socket blades support the latest Intel and AMD quad-core processors and I/O blades support up to 300 watts of PCI-e I/O, including up to three high performance graphics processing units or the latest GPU based numerical coprocessing units.

The Themis T2BC blade is the industry's first blade server to run Solaris 10 applications natively on the Sun UltraSPARC T2 Chip Multi-Threading processor within IBM BladeCenters. The T2BC functions as an independent Sun T2 server running the Solaris operating system.

Themis servers provide far greater reliability, improved life cycle management and substantially lower TCO than other COTS systems solutions.

Themis rugged, mission-critical computers.
Designed to take it.

www.themis.com (510) 252-0870

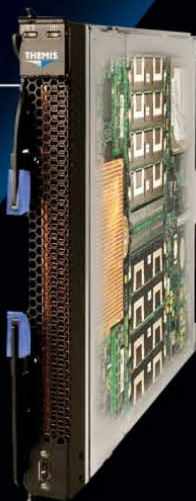
CoolShell™ CS-4U Blade Server

- 4RU, 17.75" deep subrack
- Up to 12 quad-core AMD® Opteron™ sockets
- Up to 32 GB memory per socket
- 1Gb and 10Gb/sec redundant network fabrics
- I/O and Storage with high performance RAID
- Redundant System Managers
- KVM access to Processor Blades
- Three hot swap 850W PSU's
- 25G shock and 55°C



T2BC™ UltraSPARC™ T2 Server

- Eight core Sun UltraSPARC T2 CPU
- Installs in IBM® BladeCenter® chassis
- Operates with other IBM blades
- Integrated 1Gb and 10Gb/sec Enet
- Runs Solaris™ 10 apps unmodified
- Solaris 8/9 apps with Solaris 8/9 Containers



THEMIS

Transformational.

©2009. Themis Computer, Themis, Themis logo, CoolShell, Rugged Enterprise Servers and T2BC are trademarks or registered trademarks of Themis Computer. All other trademarks contained within are property of their respective owners.

» NEWS

DHS from page 6

for command center operations; non-intrusive cargo screening; and automatic target recognition and response capability.

The chemical and biological division component involves technologies to characterize and rank chemical and biological

weapons, surveillance and early attack warning, decontamination, and defending agriculture and food supplies.

Areas of interest include improved biological and chemical analysis; instruments to detect chemical and biological threats in aerosol sprays, and liquids; sharing of chemical and biological threat sensor data


among state, local, and federal authorities; bioforensics for criminal investigations; and countermeasures for foreign animal disease pathogens affecting food animals.

The command, control, and interoperability component of this solicitation involves standards, frameworks, tools, and other information technologies to enhance communications among homeland security authorities. This includes voice communications, cyber security, criminal forensics, and advanced reconnaissance and surveillance technologies.

The explosives countermeasures component involves detecting and neutralizing explosives threats to aviation, shipping, public transportation, highways, railroads, utilities, and pipelines. This involves stand-off detection of explosives, cargo security, counter improvised explosive device (IED) technologies, data fusion, and materials to mitigate the effects of explosives.

Human factors and behavioral sciences aims to improve detection and understanding of threatening individuals, groups, and radical movements to prepare for, respond to, and recover from catastrophic events.

For questions and concerns, contact W. Adrian Groth, the long-range broad agency announcement coordinator at DHS, by e-mail at adrian.groth@dhs.gov, or DHS contracting officer Susan Eicher at susan.eicher@dhs.gov.

More information is available online at <https://www.fbo.gov/spg/DHS/OCPO/DHS-OCPO/DHSS-TLRBAA10-01/listing.html>. 

F-35 from page 6

such as the electro-optic sensors, synthetic aperture radar, maps, and radio frequency (RF) systems, Branyan says. The aircraft also takes advantage of common data links such as SINCGARS and Link 16 to pass high-bandwidth data between the F-35 and other aircraft and ground stations to provide a common operating picture.

F-35 designers have found ways to manage the obsolescence headaches that accompany COTS, Branyan says. "We've been careful to develop the architecture so that if one part goes obsolete, we don't have to redesign the entire system to replace it," Branyan says.

There are different ways to approach obsolescence management such as lifetime buys of components that suppliers

FROM CONCEPT TO PRODUCTION




RUGGED SYSTEMS

 **ON SPEC**

 **ON BUDGET**

 **ON TIME**

MILITARY SYSTEMS

RUGGED ENCLOSURES

AVIONICS SYSTEMS



DESIGNING, MANUFACTURING & INTEGRATING COMPLEX REAL-TIME EMBEDDED COMPUTER SYSTEMS FOR DEPLOYMENT IN EXTREME ENVIRONMENTS FOR 25 YEARS.

EMBEDDED SYSTEMS FOR MILITARY AND AEROSPACE APPLICATIONS THAT MEET A FULL RANGE OF ENVIRONMENTAL COMPLIANCE.

AP Labs

WWW.APLABS.COM

10864 Thornmint Road, San Diego, CA 92127
1-800-822-7522

NEWS

F-35 from page 8

decide to obsolete, Branyan says.

He notes that the F-35 program makes lifetime buys when it is economical, but says the real key for the F-35 program is a Lockheed Martin-designed software middleware that enables experts to upgrade COTS hardware and software without re-writing millions of lines of code. "We built the middleware to protect us so we can make changes without overhauling the software code," Branyan says.

The middleware enables systems designers to refresh key COTS components such as the Freescale PowerPC processors without major changes to the avionics, he continues. In the past, certifying a refresh of multifunction displays would take three to four years, now with the isolated middleware, the most recent refresh was completed in only six months, he adds.

On top of the middleware the F-35 avionics uses the Integrity DO-178B real-time operating system (RTOS) from Green Hills Software in Santa Barbara, Calif. This RTOS is already certified to FAA regulations, which is a huge advantage to Lockheed Martin, he adds.

Lockheed Martin also requires all software code to be written in the C++ programming language, which is the most common code in use today and enables faster code development, Branyan says.

COTS is also a big part of the cockpit display, Branyan says. "We use an active matrix liquid crystal display (AMLCD) from L-3 Display Systems in Alpharetta, Ga.," he adds. The pilot's helmet-mounted display (HMD) is provided by Vision Systems International (VSI) in San Jose, Calif. VSI is a joint venture between Rockwell Collins in Cedar Rapids, Iowa, and Elbit Systems of America.

"The VSI system provides the F-35 warfighter with unmatched situational awareness throughout the operational profile of the jet," says Drew Brugal, VSI president. "By keeping eyes out while viewing all critical information and video on the helmet visor, the pilot has a significant advantage in both air-to-air and air-to-ground mission execution."

The L-3 display uses COTS processors and standard glass, Branyan says. Tweaks were made to militarize it for the F-35 with antiglare and night-vision capability, but otherwise it is similar to what one might

see on commercial television, he adds.

Three years ago, Lockheed Martin was looking at multifunction displays that were based on projection technology, which was considered leading edge at the time, Branyan says. Now the technology is plasma and liquid crystal display (LCD). Having a COTS architecture makes it easier to adapt to these shifts in technology development, he adds.

Other common standards in use on the aircraft include the MIL-STD 1553 databus for weapons systems and 1394 for high-rate data systems, Branyan says.

The communication, navigation, and identification friend or foe (IFF) suite system relies on field-programmable gate arrays (FPGAs) from Xilinx in San Jose, Calif., Branyan says. The COTS devices enable Lockheed Martin to add new waveforms to embedded software radio systems in the F-35, he adds. The FPGAs also provide vice processing capability in real-time, Branyan notes.

All the avionics systems—hardware and software—have been tested in the air in the F-35 CATBIRD test system, Branyan says. The CATBIRD also enables refreshes of key electronics during the development of the program, so that when the F-35 is deployed it will have state-of-the-art systems, Branyan says.

These systems, largely made up of COTS standards and components, enable the fifth-generation fighter jet to have stealth capability and conduct air and ground attacks simultaneously, Branyan says.

What separates the F-35 from other fighter aircraft is its ability to fuse sensor information and communications from all elements of the battlespace—land, air, and sea—so the pilot can just respond to threats without adjusting sensors, Branyan says.

The F-35 also has anti-jamming capability and can block enemy emitters as well, Branyan says. This is a key game changer for how the F-35 can engage attack targets long before the target is aware of the F-35, he adds.

The aircraft will be manufactured in three variants—a conventional takeoff and landing (CTOL) for the U.S. Air Force, a carrier variant (CV) for the U.S. Navy, and a short takeoff/vertical landing (STOVL) for the U.S. Marine Corps and the United Kingdom Royal air force and navy, Branyan says. ●

www.milaero.com

PICO

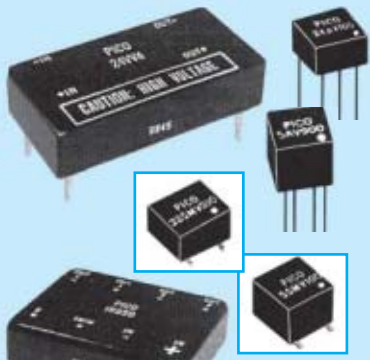
HIGH VOLTAGE

Over
2500 Std. Models
Surface Mount and Thru-Hole

DC-DC Converters

2V to 10,000 VDC Outputs


Low Profile / Isolated
Up to 10,000 Volts Standard
Regulated Models Available



See PICO's full catalog immediately
www.picoelectronics.com

High Power

Up to 350 VDC Outputs
(Units up to 150 Watts)
Regulated / Wide Input Range
Isolated Outputs



INDUSTRIAL • COTS • MILITARY
Delivery Stock to One Week
for sample quantities

PICO ELECTRONICS, Inc.
143 Sparks Ave., Pelham, New York 10803
See EEM or send direct for Free PICO Catalog
Call Toll Free 800-431-1064 • FAX 914-738-8225
E Mail: info@picoelectronics.com

» NEWS

DARPA moves ahead with National Cyber Range project for advanced cyber security research

By **JOHN KELLER**


ARLINGTON, Va.—The U.S. Defense Advanced Research Project Agency (DARPA) in Arlington, Va., is awarding multi-million-dollar contracts to two research organizations to build prototype advanced computing centers to demonstrate and test cyber security, defensive information warfare, and information assurance technologies.

DARPA awarded a \$30.8 million contract to the Lockheed Martin Simulation, Training, & Support segment in Orlando, Fla., and a \$24.8 million contract to the Johns Hopkins University Applied Physics Laboratory in Laurel, Md., to develop prototypes of the National Cyber Range (NCR), which is to revolutionize the state of the art for large-scale cyber testing.

The National Cyber Range will provide an advanced computer and data networking laboratory in which experts can assess information assurance and survivability tools; replicate the kinds of large and complex computer networks that support U.S. Department of Defense weapons and operations; conduct several large cyber security experiments at the same time; conduct realistic tests of the U.S. Global Information Grid (GIG); and develop and deploy revolutionary cyber testing capabilities.

The National Cyber Range is DARPA's contribution to the federal Comprehensive National Cyber Initiative (CNCI), a secret multibillion-dollar project to build defenses for government computers against foreign and domestic hackers and cyber terrorists.

The National Cyber Range project seeks to develop a revolutionary, safe, automated, and instrumented environment for national cyber security research organizations to evaluate leap-ahead cyber security approaches, and provide a place for advanced cyber experiments.


For more information, visit DARPA online at www.darpa.mil, Lockheed Martin Simulation, Training, & Support at www.lockheedmartin.com, or the Johns Hopkins Applied Physics Lab at www.jhuapl.edu. 

» IN BRIEF

provide a better understanding of Earth's formation or perhaps the origin of life on Earth, NASA officials say. The selected proposals are the Surface and Atmosphere Geochemical Explorer, or SAGE, the Origins Spectral Interpretation Resource Identification Security Regolith Explorer spacecraft, and MoonRise: Lunar South Pole-Aitken Basin Sample Return Mission. The proposed missions would probe the atmosphere and crust of Venus; return a piece of a near-Earth asteroid for analysis; or drop a robotic lander into a basin at the moon's south pole to return lunar rocks back to Earth for study. NASA will select one proposal for full development after detailed mission concept studies are completed and reviewed. The studies begin during 2010, and the selected mission must be ready for launch no later than Dec. 30, 2018. Mission cost, excluding the launch vehicle, is limited to \$650 million. Each proposal team initially will receive approximately \$3.3 million in 2010 to conduct a 12-month mission concept study that focuses on implementation feasibility, cost, management, and technical plans. For more information, visit <http://newfrontiers.nasa.gov>.

QinetiQ brings Combined Aerial Target Service for Mirach online

QinetiQ in Farnborough, England, brought into service the Mirach advanced sub-sonic aerial target, as part of the Combined Aerial Target Ser-



Nano Break Away Connector

Releases When it Needs To ... In Critical Situations

- .025" (.64mm) on center
- Available in 6, 11, 16, and 28 position
- Environmentally Sealed
- Ultra Small
- Easy to Use
- Adds Retention

www.omnetics.com

- >> HIGH FLEXIBILITY
- >> PROVEN TECHNOLOGY



Value Added Power Solutions from Martek Power Abbott

FLEXIBLE SOLUTIONS WITH FIELD PROVEN STANDARD MODULES



Short development cycle
Low cost
Minimal NRE
Proven technology
Reduced risk

flexibility

A wide variety of inputs, including DC from 9 to 400 Vdc; AC from 85 to 265 Vac single or three phase, 47 to 440 Hz.

Outputs can range from 2 to 400 Vdc, pure sine wave, 27 to 220 Vac, 500 to 1600 Hz. Protection features such as current limit, overvoltage, over-temperature protection are available.

Built in test, TTL level control signals and various interface options are also available.

AS9100 / ISO 9001:2000 CERTIFIED



Power For The New Technology

tel. 310.202.8820

web: www.martekpower.com

e-mail: sales.mpa@martekpower.com

» NEWS

AeroMech team to build Sand Dragon route-surveillance UAV that runs on heavy fuels

By **JOHN KELLER**

WRIGHT-PATTERSON AFB, Ohio—The U.S. Air Force is asking an industry team

led by AeroMech Engineering Inc. in San Luis Obispo, Calif., to demonstrate the Sand Dragon medium-altitude, long-endurance

unmanned aerial vehicle (UAV) for route surveillance on missions as long as 24 hours.

The Arcturus-UAV T-16 may be a smaller version of the eventual Sand Dragon UAV design.



EFFICIENT, RELIABLE POWER FOR YOUR CRITICAL MISSION

New Module Converts 270V Bus Power to 28V for Subsystems

Power your avionics or military subsystems more efficiently than ever with VPT's new VPTHVM-270 bus converter.

New design advances in this module reduce your power input requirements and improve thermal management for your power system.

- Greater than 91% efficient
- Up to 200W output power with a single output
- Power multiple VPT converters from a single module
- Can be used in parallel for higher power
- Wide input voltage range: 160 to 500 volts per MIL-STD-704
- Full operation over a wide -55°C to +100°C standard



Complete specifications, connection diagrams, technical video and catalog are available.

Contact VPT at:

Web: www.vpt-inc.com

Phone: 425.353.3010

E-mail: vptsales@vpt-inc.com



The Sand Dragon UAV will operate without the use of prepared runways, and will run on heavy fuels such as JP-5 and JP-8 jet propellants that are the foundation of military universal fuels that power jet and turboprop aircraft, nearly all tactical ground vehicles, electrical generators, and even the gas turbine engine of the U.S. Army M1 Abrams main battle tank.


Officials of the Air Force Research Laboratory (AFRL) at Wright-Patterson announced their plan last month to award a sole-source contract to AeroMech to finish developing, and to demonstrate, the Sand Dragon UAV, which will be able to accommodate an electronic and electro-optical payload that weighs a minimum of 45 pounds and consumes 500 watts of electricity.

Air Force researchers are asking AeroMech to demonstrate a runway-independent launch and recovery system for the 24-hour-endurance Sand Dragon Tier II UAV, as well as the pilotless aircraft's control station, for quick deployment to the Middle East and other military operational areas.

Funding for this contract will be \$16.4 million this year, and \$2.14 million next year, Air Force officials say.

AeroMech, which makes the Fury, SuperFly, LCAT, and LCAT II UAVs, has been cooperating with UAV makers Arcturus-UAV LLC of Rohnert Park, Calif., and Cosworth Ltd. of Northampton, England, to develop a heavy fuel-powered UAV.

Cosworth's AE-1 engine is a compression diesel engine designed and developed specifically for UAV applications. Arcturus-UAV, meanwhile, builds the T-20 Tier II class UAV with 17-foot wingspan and 35-pound payload capability with 16 hours of endurance. AeroMech has expertise in UAV sensor turrets and flight control and mission planning systems.

For more information, visit AeroMech online at www.aeromechengineering.com, Arcturus-UAV at www.arcturus-uav.com, or Cosworth at www.cosworth.com. 

Fiber-optic avionics connectors show performance advantages for avionics systems

By **JOHN McHALE**

HARRISBURG, Pa.—A steady aerospace and defense market combined with the performance advantages of fiber over copper has designers of optical avionics connectors confident in the short- and long-term future.

“Recent economic conditions have affected all industries to varying degrees,” says Greg Powers, market development manager of global aerospace, defense & marine at Tyco Electronics in Harrisburg, Pa. “Some segments, such as those funded by civil infrastructure improvement, have fared better than others. The military, while not growing to the extent of previous years, has at least remained stable. Given world events, there has actually been a much higher importance placed on effective and abundant C4ISR (command, control, communications, computing, intelligence, surveillance, and reconnaissance). This segment is highly dependent upon bandwidth, for which fiber optics is ideal, and this trend is not slowing.”

Product lines dedicated to avionics connectors are less affected by the economic downturn, says Christophe Masnou, marketing manager, RF interconnect at the Aerospace, Defense, Instrumentation division of Radiall in Chandler, Ariz. These fiber-optic avionics connectors “have replaced existing technologies by offering newer capabilities with cost savings, lower weights, and/or higher bandwidth advantages.”

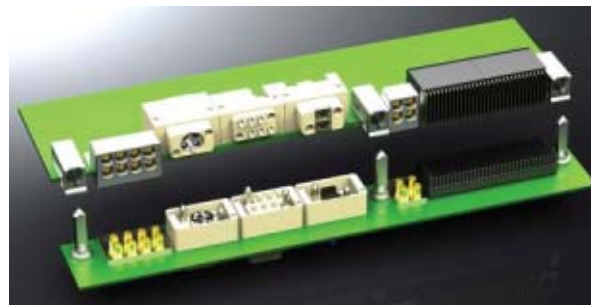
As data rates elevate, copper-based cable assemblies become more sophisticated and expensive, closing the cost differential between fast copper and fiber-optic solutions, Powers says. “Fiber optics hold significant advantages over fast copper relative to weight reduction, ground/EMI attributes in composite aircraft, and speed over distance. As a result, the primary trend for avionics is the proliferation of proven contact systems into more mainstream applications that were once dominated by copper.”

Power says different standards groups—the VITA Standards Organization, ARINC/AEEC, and SAE—“are setting the stage for accelerated deployment of standard fiber-optic solutions. The key to this is the utilization of fiber-optic termini with aerospace pedigree, namely the Expanded Beam,

ARINC 801, and the MT ferrule.

“In addition to input/output and production break connectors, these technologies are now being designed into fiber-optic-based backplane connector modules to facilitate embedded computing applications,” he continues. “This will allow the network architect true end-to-end, fiber-optic connectivity via industry-standard hardware. Concepts such as location independent architecture, where LRUs [line replaceable units] and LRMs [line replacement modules] are dispersed throughout a vehicle while able to interact as if co-located, are coming closer to realization.”

Tyco Electronics produces VITA 66 fiber-optic backplane connector modules—with three module types in development for VITA 66 based on expanded beam,

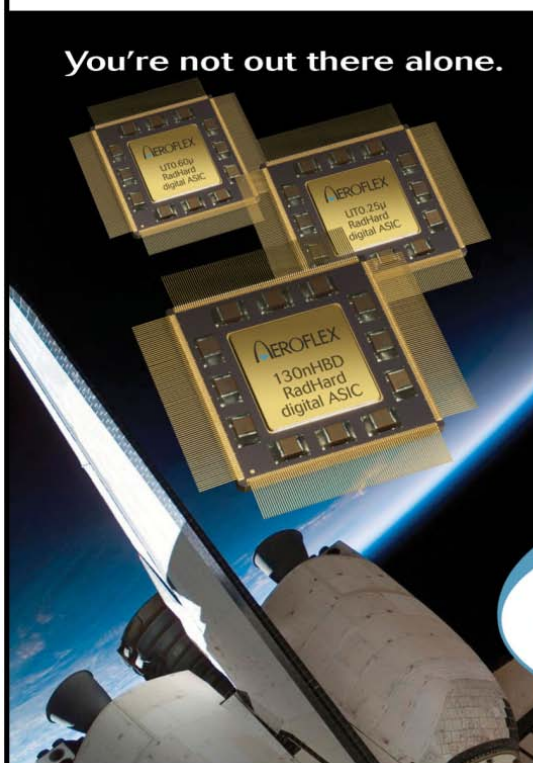


Tyco Electronics VITA 66 Fiber Optic Backplane Connector Modules have three module types in development.

ARINC 801, and MT, Powers says. Tyco Electronics’ Tactical Expanded Beam Connectors—M83526/20 and /21—are rugged fiber-optic connectors for multimode and single-mode connectors for adverse environments, he adds. ●

Launch with a RadHard ASIC you trust

You're not out there alone.

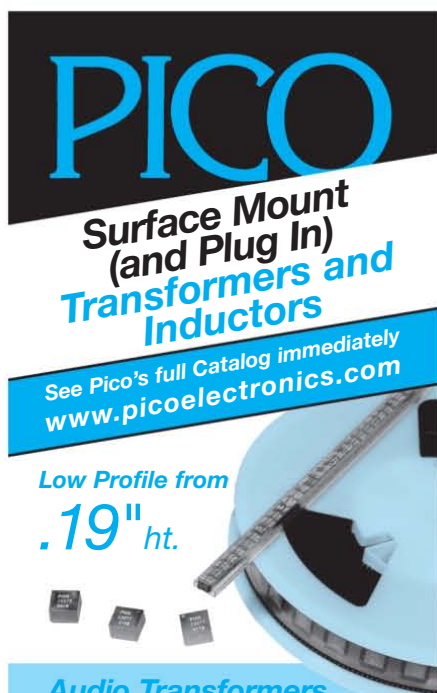


Aeroflex Colorado Springs continues to provide the latest innovations in RadHard digital ASICs, as we have for over 28 years! Our new 130nHBD deep-submicron technology allows significant advantages for HiRel apps.

- High speed, low power
- 130nHBD, 0.25μ, 0.60μ
- Validated radiation performance
- Trusted CAT1A accreditation
- Aeroflex Gaisler IP options support your ASIC designs

www.aeroflex.com/radhardASIC
800-645-8862

AEROFLEX
A passion for performance.



PICO
Surface Mount
(and Plug In)
Transformers and
Inductors

See Pico's full Catalog immediately
www.picoelectronics.com

Low Profile from
.19" ht.

Audio Transformers

Impedance Levels 10 ohms to 250k ohms,
Power Levels to 3 Watts, Frequency Response
±3db 20Hz to 250Hz. All units manufactured
and tested to MIL-PRF-27. QPL Units available.

Power & EMI Inductors

Ideal for noise, spike and Power Filtering
Applications in Power Supplies, DC-DC
Converters and Switching Regulators

Pulse Transformers

10 Nanoseconds to 100 Microseconds. ET
Rating to 150 Volt Microsecond, Manufactured
and tested to MIL-PRF-21038.

Multiplex Data Bus Pulse Transformers

Plug-In units meet the requirements
of QPL-MIL-PRF 21038/27.
Surface units are electrical equivalents
of QPL-MIL-PRF 21038/27.

DC-DC Converter Transformers

Input voltages of 5V, 12V, 24V And 48V.
Standard Output Voltages to 300V (Special
voltages can be supplied). Can be used as self
saturating or linear switching applications. All
units manufactured and tested to MIL-PRF-27.

400Hz/800Hz Power Transformers

0.4 Watts to 150 Watts. Secondary Voltages 5V
to 300V. Units manufactured to MIL-PRF-27
Grade 5, Class S (Class V, 155°C available).

Delivery-Stock to one week
for sample quantities



for **FREE** PICO Catalog
Call toll free **800-431-1064**
in NY call **914-738-1400**
Fax **914-738-8225**

PICO Electronics, Inc.

143 Sparks Ave. Pelham, N.Y. 10803
E Mail: info@picoelectronics.com
www.picoelectronics.com

» NEWS

» IN BRIEF

vice (CATS) contract for the United Kingdom's armed forces, having completed verification and operational trials. Mirach targets are manufactured by SELEX Galileo of Finmeccanica and offer new payloads to meet United Kingdom Ministry of Defense (MOD) training requirements, QinetiQ officials say. These include the integration of commercial off-the-shelf (COTS) technologies like chaff and flare, an intense onboard heat source, miss distance indicator capabilities, radar enhancements and an identification friend or foe (IFF) transponder plus the ability to present towed infrared and semi automatic radar targets. Mirach operations have commenced from designated land-based ranges and the CATS provision will also allow Mirach to be launched from on-board ship.

Raytheon wins \$1.1 billion order from Taiwan for Patriot missile defense systems

Raytheon in Tewksbury, Mass., won foreign military sales contracts totaling \$1.1 billion to build the Patriot Air and Missile Defense System for Taiwan. These include ground-system hardware contract of \$965.6 million, and spares contract of \$134.4 million; both contracts came from the U.S. Army Aviation and Missile Command at Redstone Arsenal, Ala. Raytheon is the prime contractor for domestic and international Patriot Air and Missile Defense Systems and system integrator for Patriot Advanced Capability-3 missiles.

Aegis ballistic missile defense system signal processor upgrade tracks missile targets in tests

The second generation of the Lockheed Martin Aegis ballistic missile defense (BMD) system, BMD 4.0.1, detected, tracked, and engaged different ballistic missile targets during a series of simulated tracking exercises in the Pacific. The key feature of the new system is an integrated signal processor to improve discrimination between ballistic missiles and their countermeasures, say Lockheed Martin officials in Moorestown, N.J. During four tests, the guided missile cruiser USS Lake Erie, with upgraded BMD 4.0.1 Weapon System, detected, tracked, and launched simulated Standard

Missile-3 (SM-3) weapons to intercept ballistic missiles launched from the Pacific Missile Range Facility in Kauai, Hawaii. The targets ranged from simple separating medium-range missiles to sophisticated, separating short-range missiles designed to confuse missile-defense systems. During the tests, USS Lake Erie transmitted data via a tactical data link to other ships and shore command facilities. Over the next year, USS Lake Erie will complete additional tests, leading up to full operational certification of the Aegis BMD 4.0.1 system in early 2011.

FAA solicits bids for NextGen contracts worth \$7 billion

The Federal Aviation Administration (FAA) in Washington is soliciting bids from companies interested in competing for NextGen support contracts worth about \$7 billion, the largest award in the agency's history. Under the umbrella awards, called System Engineering 2020 (SE2020), the FAA will award as many as five separate contracts for research-and-development and systems engineering work that will help the agency deliver the NextGen air traffic management system. Work will enhance NextGen initiatives such as Automatic Dependent Surveillance-Broadcast (ADS-B), system-wide information management, and data communications. Contractor teams will focus on capabilities such as trajectory-based operations, collaborative air traffic management, and reduced weather impact. The FAA is encouraging bids from teams of small companies, prime contractors, and subcontractors. Five-year contracts will be awarded next summer, with subsequent three- and two-year options.

Boeing delivers 500th Combat Track II airborne intelligence system to U.S. Air Force

Boeing delivered the 500th Combat Track II kit, an airborne intelligence system for U.S. Air Force cargo and bomber aircraft. "These systems allow air crews to respond to threats more quickly and effectively," says Capt. Scott Frank, Air Force program manager for Combat Track. "Combat Track II has become critical to our mission, providing timely intelligence to support combat forces." The Combat Track II system provides aircrews with command and control information as well as secure, beyond line-of-sight, encrypted communications between the aircraft and Air Operations Centers worldwide.

SPECIAL REPORT

First round ACCURACY

Special forces operators demand their electro-optic equipment—laser designators, laser sites, thermal imagers, night-vision goggles—be low power, light weight, rapidly deployed, and deadly accurate.

By **JOHN McHALE**

Many special forces operators like to say the last thing they want is a fair fight. They want to overwhelm the enemy so that he cannot even shoot back.

Special forces—whether they are Army Rangers or Green Berets, Delta Force, or Navy Seals—depend on technology that gives them first-shot accuracy whether it is lasing a target for unmanned aircraft or killing the enemy with one shot from a rifle. Their laser rangefinders during the early days of the conflicts in Afghanistan amazed warlords as operators would mark a target with their laser designator, then within minutes Navy aircraft or armed unmanned aerial vehicles (UAVs) would destroy it.

Electro-optics technology—laser designators, laser sights, thermal imagers, and night-vision goggles—has enabled these small units of about six-to-twelve-man teams to dominate modern battlefields.

Different type of warfighter

Special Forces have unique missions and unique needs when compared to the entire Army, points out David Strong, vice president of marketing at infrared sensor specialist FLIR Systems in Beaverton, Ore. Their missions also get priority and are not hampered by the typical procurement restraints, he adds.

Individual units have congressional approval to go right to the manufacturer of night-vision systems, cameras, weapon sights, etc., and buy directly for their unit, says Les Hodges, business development

The Advanced Thermal Weapon Site from FLIR Systems provides special forces units with imagery through total darkness, fog, smoke, and dust.

www.milaero.com

MILITARY & AEROSPACE ELECTRONICS | February 2010 | 15

» SPECIAL REPORT



The Laser Target Locator Module (LTLTM) from BAE Systems weighs less than 5.5 pounds, has a direct-view optic system, a laser range finder, a digital compass, a GPS receiver, and a night-vision camera.

manager for ITT Night Vision in Roanoke, Va.

As with our parts of the Army, they will go through the Army's Rapid Equipping Force (REF) to get what they need quickly, Strong says. For more information on the REF, visit www.ref.army.mil/portal/.

For the foreseeable future, individual warfighters will continue to have requirements for night-vision capability—for new systems and maintaining legacy devices, Hodges says.

Special forces operators typically want to obtain equipment as quickly as possible, which one might think means off the shelf, but often they will tweak it in different ways to meet their needs, says Glen Bassett, director with the Combat Systems product line for Raytheon Network Centric

Systems in McKinney, Texas. "They are always pushing the envelope."

This type of procurement enables special forces officials to be more aggressive when acquiring new technology, but "they are also very innovative and creative" with their requirements, Bassett says. What they want from technology is capability more than balancing size, weight, and power, he adds.

"Their goal is to engage quickly with first-round accuracy," Bassett says. "They are always looking to put the first round on the target."

In thermal imaging and for special forces accuracy of laser designation is very important as it cuts down collateral damage especially in urban environments, Strong says.

Achieving that type of accuracy demands the weapon have the right munitions, be accurately calibrated, and properly aimed, so all the soldier has to do is pull the trigger, Bassett continues. To acquire this capability special forces operators will sacrifice weight and power advantages, he adds.

Equipment delivered to special forces is often low quantity, so it is not unusual to have an electro-optical system or device

used by Army infantry and adapted for use by special forces—or vice versa.

Raytheon's work on the Mk47 grenade launcher for a special forces application is an example.

"Raytheon provides a unique capability to the U.S. Army and Special Operations Command, bringing thermal imaging to the Mk47 40-millimeter grenade launcher," Bassett says. "The Mk47 is a very versatile weapon for special operations forces. Raytheon's Thermal Weapons System provides the long-range night-vision capability to the Mk47."

The AN/PAS-13E Thermal Weapon Sight (TWS) requires no visible light to operate and will not shut down or bloom when hit by direct light. The sensor avoids detection because it does not emit heat or RF energy.

The device's electronic zoom is suitable for use as a weapon-mounted sight and as a handheld imager. The imager saves power by using an eye-cup-activated standby mode, and uses L91 AA disposable lithium batteries or rechargeable nickel metal hydride batteries.

Human factors

What really drives development of any warfighter system, but especially those in special operations, are human factors, Bassett says.

Many companies make clip-on thermal weapon sights, including FLIR, which produces the ThermoSITE HISS long-range thermal weapon sight. The device can see targets in total darkness, through smoke, fog, and most obscurants, according to the

Special forces units need eye-safe laser components to cut down on accidental eye injuries

Special forces units are requiring their laser sites, designators, and other laser equipment with eye-safe wavelength of 1540 to 1890 nanometers to cut down on eye injuries, say engineers at DILAS in Tucson, Ariz.

"The longer wavelength by itself means nothing, it is the eye-safe properties of the longer wavelength that make it attractive to the military," says Rajiv Pandey, senior product manager at DILAS. If there is accidental exposure to the eye it will not hurt the retina, he explains. It might cause minor damage to the outside of the eyeball, but it will not damage the optic nerve, Pandey adds.

The eye-safe components DILAS builds are conduction-cooled, QCW, vertical-diode laser stacks, which can operate in temperatures between 20 and 35 degrees Celsius, Pandey says. DILAS vertical stacks are designed specifically for applications such as diode-pump solid-state laser, materials, processing, and defense applications.

"We don't sell directly to special forces units, but to the subsystem laser developers and prime contractors," Pandey says. DILAS bars are efficient because "we go out and find the most efficient bars available and use them," whereas others will just develop their own bars in-house or in their own fabrication facility, Pandey says.

The improved efficiency means that when the laser exits the fiber it will be as strong as and power efficient as possible, he adds. For the military it is more important to have lower heat generation and power consumption, which translates into "overall lower cost of ownership," Pandey continues.

The DILAS stacks have a compact and planar design and a center hole for module alignment. Conduction-cooled QCW stacks with very low pitch (400um) and peak powers can be reached to as much as 300 watts per bar. For more information, visit www.dilas.com.

LAT: N 31 52.177
LON: E 64 54.704
AZ: 176.2
EL: +9.5



EXTRAORDINARY WEAPON SIGHTS. YOU CAN SEE THE DIFFERENCE A MILE AWAY.



FLIR Systems, the leading innovator of EO/IR technology, goes the distance for global special operations forces across the spectrum of missions with our ThermoSight™ advanced weapon sights. From surveillance and recon to target acquisition and force protection, we meet unique SOF operational requirements for durability, crisp imagery, ultra-long range capabilities, minimal weight and up to seven hours of battery life. To share our extraordinary vision go directly to the source. www.FLIR.com/GS



© 2010 FLIR Systems, Inc.



The AN/PAS-13E Thermal Weapon Sight (TWS) from Raytheon and the U.S. Army avoids detection because it does not emit heat or RF energy.

FLIR data sheet. It also has been tested on .50 caliber machine guns and can engage targets at ranges beyond 1,500 meters.

Working so closely with the end users provides instantaneous feedback on designs, Bassett says.

Power management

Batteries that can run for days, not hours, and power the 21st century warfighter for an entire mission is a kind of Holy Grail concept within the defense industry. Bassett says Raytheon is working on power source solutions just as is every other prime contractor.

Special forces operators want longer running batteries simply because the batteries represent less weight that infantrymen must carry on missions, Strong says. Foot soldiers do not want to carry extra batteries or chargers when they could be packing more ammunition, he adds.

Power is sometimes the reason behind the choice of cooled or uncooled thermal imagers, Strong says. Cooled systems are lighter in weight and lower in power usage, yet have shorter ranges than cooled sensors.

"We make a battlefield handheld powerpack for cooled sensors," Strong says.

FLIR makes its own coolers and other components to ensure the life cycle of the product, he adds.

Uncooled systems are heavier, consume more power and are longer range, Strong says. FLIR offers a cooled product that warfighters can carry in their ruck sacks called the Recon III. Strong says the device has zoom settings for short-, medium-, and long-range reconnaissance missions. It also provides precision geo-location of targets with an eye-safe laser rangefinder.

FLIR's infrared detectors all have high-definition components so that the picture is much like what is seen on high-definition televisions, Strong says. FLIR is working on getting a high-quality laser into a small package at low power, Strong says. That type of combination is still years away, he adds.

"We've got a whole range of man-portable sensors that do various jobs at FLIR," Strong says. Some products were designed specifically for special forces applications, but were available later as off-the-shelf products for other users in the military and law enforcement, Strong says.

Night vision and sensor fusion

A current trend in electro-optics is sensor fusion—fusing short-wave infrared and long-wave infrared—to give a more detailed view to the warfighter. ITT's

Enabling real-time video transmission to ground forces from UAVs

Engineers at Elisra in Bene Beraq, Israel, have developed wrist-worn technology for warfighters that enables them to see real-time video coming from unmanned aerial vehicles (UAVs), resulting in reduced time between sensor and shooter.

"Elisra offers various solutions for communications link between UAVs and the soldier that are a part of the Digital Army Program in Israel, says an Elisra spokeswoman. Their solution is called V-Rambo—Dissemination of Intelligence via DL (Data Link), voice over Internet Protocol, and battlespace video net systems, she adds.

The system has a video and telemetry receiver about the size of a Blackberry cell phone, the spokeswoman says. The device can be carried in a pocket or pouch. The video and data can be displayed in real time, either on a wrist-wearable monitor, or on other types of portable display devices, such as laptop computers, she says.

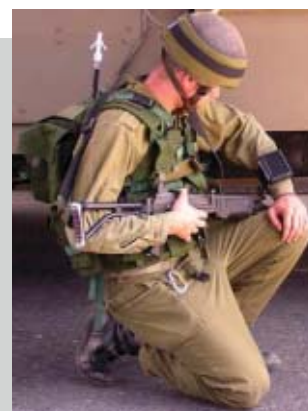
Elisra also offers a pocket-sized, multi-sensor-compatible C4ISR system called Multi V-Star that "enables the buildup of real-time situation awareness", and works with two UAVs at once, the spokeswoman says.

With the support of two data-links, Multi V-Star can receive transmissions—dual-frequency analog and/or digital data link—from two different types of UAV sources, simultaneously. Unlike oth-

er systems, Multi V-Star receives video and telemetry, and then correlates the video information with the local GIS map and 3D terrain information.

Multi V-Star provides improved situational awareness by manipulating digital maps, tactical overlays, and real-time video streams from several UAV sensors. The system handles dual day/night video electro-optical sensor support, and can perform automatic map registration, dual targeting surveillance, and dual recording while simultaneously engaging two UAV platforms. Multi V-Star also allows dissemination of real-time video and metadata to networked battlefield users.

Elisra also produces an active man transceiving system (AMTS) that gathers intelligence for unmanned ground vehicles, UAVs, and reconnaissance, surveillance and targeting acquisition (RSTA).



The wrist-worn V-Rambo from Elisra in Bene Berak, Israel, provides individual soldiers with real-time video and data from unmanned aerial vehicles (UAVs).



SPECIAL REPORT

The ThermoSITE HISS, a long-range thermal weapon site from FLIR Systems, can be clipped on to a weapon's day scope.

objective lens of many of ITT's night-vision devices.

Special forces users also want multi-tasking from their night-vision equipment, FLIR's Strong says. His company makes a device called the Advanced Thermal weapon sight (ATWS) that combines thermal weapon sight and handheld imager for surveillance operations.

The ATWS provides imagery through total darkness, fog, smoke, and dust. It also has large pushbutton controls that adjust the image and free the user from complicated menus.


Another laser system designed for nighttime use is the Laser Target Locator Module, or LTLTM, from BAE Systems in Arlington, Va. The LTLTM is an all-weather, lightweight, handheld laser target locator system that enables soldiers to identify target locations while on foot, in daylight, or at night, and in fog and smoke. The device is produced for the U.S. Army Program executive Office (PEO) Soldier at Fort Belvoir, Va.

The LTLTM weighs less than 5.5 pounds, has a direct-view optic system, a laser range finder, a digital compass, a GPS receiver, and a night-vision camera based on thermal cameras used in BAE Systems' thermal weapon sights, according to the release. Deliveries are scheduled to begin in 2010.

The system's light weight and its ability to determine target coordinates quickly makes a soldier's job easier, says Bruce Zukauskas, LTLTM product line director for BAE Systems.

Sensor networking

Raytheon engineers are developing networked fire control as well, Bassett says. This is another way of improving first shot accuracy, reducing time to target, and ensuring target identification, he adds.

Essentially a warfighter would have access to any sensor on the battlefield at any time before he pulls the trigger or marks a target for an aerial strike, Bassett continues. 



The Enhanced Night Vision Goggle from ITT Night Vision fuses image intensification with thermal infrared images for improved situational awareness.

ENVG—enhanced Night Vision Goggles—has sensor fusion capability. One version that mounts to the soldier's helmet is in use with special forces units, Hodges says. The device optically combines an image intensification tube, and thermal infrared micro-bolometer technology enables improved mobility and situational awareness.

This system comes in a monocular unit, with a separate battery pack for helmet-mounted or handheld use. The ENVG provides flip-up, tilt, fore/aft adjustment; left/right eye use; and quick disconnect from the helmet. The device has expanded viewing capability from highlight conditions to total darkness and through battlefield obscuration.

ITT and the U.S. Army Night Vision Laboratory at Fort Belvoir, Va., are also working on the ENVG (D), which will enable soldiers to transmit images digitally to aircraft, command units, and other players on the digital battlefield, Hodges says. "Right now only the warfighter sees what he sees and it ends there," but eventually he will be able to share that imagery in real-time with rest of his deployed force, he adds.

The ENVG (D) uses thermal and low-light digital sensors to export and import digital imagery, connecting the dismounted soldier to the digital battlefield.

Night vision on a chip

The new system will essentially "be night vision on a chip," Hodges says. The new sensor is designed with a microchannel plate complimentary metal-oxide semiconductor (MCPCMOS), he adds, and fuse image-intensified video with thermal infrared video, Hodges continues.

The digital format enables a common reconnaissance platform within a digital network that will improve not only the situational awareness of the individual warfighter but the group as well, he says. The user can send fused video and receive images as well, Hodges adds.

Another ITT night-vision device for special forces is the third-generation AN/PVS-14, Hodges says. The unit can be handheld, head-mounted, adapted to a camera or camcorder, and weapon-mounted.

The AN/PVS-14 weighs little more than 12 ounces—similar to the ITT ENVG—with one AA battery. Accessories include the 3X Military F/1.5 lens, and a Galilean afocal telescope, which mounts to the

Mid-wave or long-wave?

Both. HOT-IR™ infrared sensor technology from DRS wins on size, weight, performance, cost and reliability – for both mid-wave and long-wave applications.



HOT-IR™

12μm 640 MW

15μm 640 LW

**12μm 1280 MW
(720p)**

Not only is HOT-IR from DRS a superior EO/IR sensor technology, it's also the price leader. DRS has engineered a breakthrough in Mercury Cadmium Telluride technology which results in smaller pixel pitch and better image quality at Higher Operating Temperature – something we call HOT-IR. HOT-IR leads to smaller size and weight of both the sensor and system, combined with unmatched reliability. All of which translates into drastically reduced logistical costs and vastly superior performance. Learn more at drs.com/mct.

www.drs.com



A Finmeccanica Company

TECHNOLOGY FOCUS

A sea change in small electronics

Miniaturized electronics are leaving the labs, entering production, and being integrated into military and aerospace system designs.

By **COURTNEY E. HOWARD**

Nanotechnology, microelectromechanical systems (MEMS), and nanoelectromechanical systems (NEMS)—once only fodder for fantasy and science fiction—has in recent months reached a new milestone. Advancements in microelectronics are helping to reduce the size, weight, cost, and carbon footprint of various military and aerospace electronics in land, sea, air, and space applications.

Bigger isn't always better

Virtually all current, and even future, mil-aero platforms suffer space constraints. Defense organizations, including the U.S. Department of Defense (DOD) and the United Kingdom's Ministry of Defense (MOD), have long partnered with industry and academia to resolve the challenge of infusing military platforms with comprehensive, advanced electronics technology despite size, weight, power, and cost (SWaP-C) limitations. Many researchers, engineers, academics, and pundits say they believe nanotechnology and MEMS are the answer.

"The ability to condense the size of electronic devices while increasing their capability, features, and speed has greatly enhanced the ability to package electronics in considerably smaller, more functional form factors," Greg Jones, North American sales manager at Omnetics Connector Corp. in Minneapolis, says of nanotechnology and MEMS.

Omnetics latest dual row and circular Nano connectors are typically used for just this purpose, says Jones: "To save space, weight, and mass, while allowing for more digital signal paths in applications ranging from unmanned aerial vehicles (UAVs) to handheld devices deployed in the military, homeland security, and law enforcement."

Miniature electronics

"Enhancing performance and improving mission survivability in all areas will be impacted [by nanotechnology and MEMS], enabling light weight and improving functionality in systems in orbit and being

flown," says Peter Antoinette, president and chief executive officer of Nanocomp Technologies in Concord, N.H.

Antoinette and his colleagues at Nanocomp are decreasing the weight of systems and entire platforms in the military aircraft and satellite community by using carbon nanotube (CNT) technology. Nanocomp engineers have developed thin, lightweight, electrically conductive wires, cables, and sheet materials constructed of carbon nanotubes.

Copper cabling constitutes roughly one third the weight of a satellite and accounts for thousands of pounds of an aircraft's weight, Antoinette explains. The braided copper in the shielding alone contributes approximately half the weight of a coaxial cable. "Shielding made of carbon nanotubes makes a huge impact on mil-aero applications," he says. "Replacing the shielding in an aircraft with carbon nanotube materials can reduce the weight of aircraft wiring by as much as 30 to 50 percent, or as much as 1,000 pounds. Replacing the copper core conductor with a CNT core conductor would result in up to a 70 percent



At Nanocomp, a 25-foot roll of double-wall carbon nanotube material is being prepared for delivery to a customer.

Nanocomp Technologies' CNT fabric stopped a 9-millimeter, jacketed round in controlled ballistics testing. This material, shown at right, is roughly the same thickness as six stacked business cards.



Nanocomp's large-format carbon nanotube textiles are currently being evaluated by the U.S. Air Force for potential deployment in advanced electromagnetic interference (EMI) and electrostatic discharge (ESD) shielding systems on both manned and unmanned aircraft.

weight reduction for cables; however, this is unlikely to happen for quite some time."

Nanocomp won a Phase II Small Business Innovation Research (SBIR) grant from the Air Force Research Laboratory (AFRL) at Wright-Patterson Air Force Base, Ohio, to continue the development of carbon-nanotube-based, lightweight, conductive wires offering electromagnetic interference/electromagnetic pulse (EMI/EMP) resistance.

Nanocomp engineers, together with officials from the U.S. government and two prime defense contractors, are working on EMI shielding based on carbon nanotube technology. "It is a very big project, in excess of \$4 million and managed by AFRL, to develop



» TECHNOLOGY FOCUS

lightweight technology that enables planes to resist EMI and interference,” Antoinette says. “The project is very important to the Air Force, and will enable manned and unmanned vehicles to perform in areas with lightning and EMP/EMI threats.”

Shielding soldiers

Nanocomp’s next-generation carbon nanotube material also could be applied to warfighters in the battlefield. Nanocomp is working with U.S. ground forces to apply its EMI shielding “skins” and high-strength sheets to protect infantry forces.

“Soldiers are putting more and more powerful radios and devices on their vests,” Antoinette describes. “These are cell phones on steroids, and electric and magnetic fields (EMFs) radiate both ways. Layers of carbon nanotubes can block emissions and protect the health of soldiers.”

Engineers at Nanocomp and the Natick Soldier Center in Natick, Mass., are partnering to improve soldier armor. “Our objective is to help soldiers on the ground by providing armor that offers reduced weight and provides better protection. In the past year, we have stopped handgun rounds

with ultra-lightweight carbon-nanotube-based panels that are roughly six business cards thick.

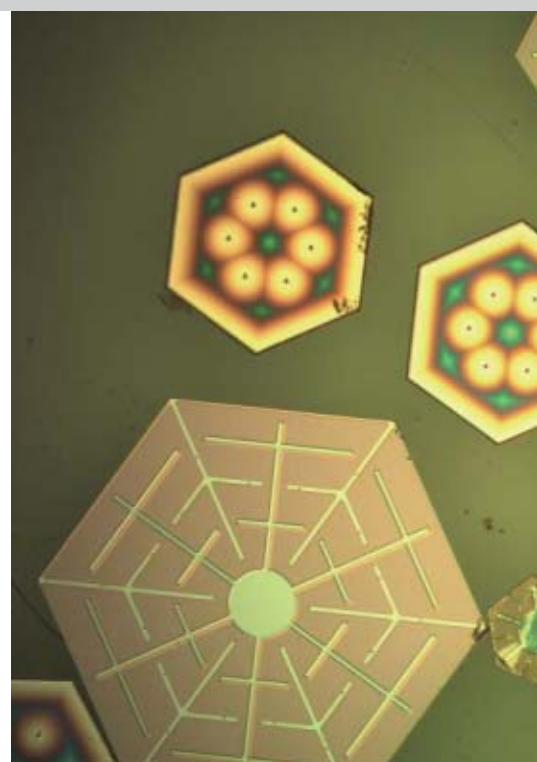
“It is still early and we still have a long way to go,” Antoinette admits, “but so far, the results have been promising. In general, that’s where nano and MEMS have moved—off the lab bench and into qualification phases.”

Nanotechnology and MEMS, although generally considered to be emerging technologies, are already being applied in semiconductor, power storage, and component- and system-level designs. In fact, Antoinette says, Lockheed Martin’s nanotube electronics flew on the last space shuttle mission, which is a strong indication of how far nanotechnology has come.

Nanotubes in space

Engineers at Lockheed Martin in Palo Alto, Calif., and Nantero Inc. in Woburn, Mass., worked together to develop radiation-resistant, carbon-nanotube-based memory, which was tested on a recent space shuttle mission.

NASA engineers, in turn, incorporated the NRAM, a nonvolatile random access



Sandia’s thin crystalline-silicon photovoltaic cells measure from 14 to 20 micrometers thick and 0.25 to 1 millimeter across. (Image by Murat Okandan.)

memory chip, into special, autonomous testing configurations installed into a carrier at the aft end of the payload bay. It was launched into space as part of STS-125, the May 2009 mission of the Space Shuttle Atlantis that serviced the Hubble Space Telescope.

“Carbon nanotubes have tremendous potential for a wide range of future space-based applications, and we couldn’t be happier for the success of this experiment,” says Dan Powell, the chief nanotechnologist at NASA Goddard Space Flight Center (GSFC) who managed the project.

“The experiment was a proof-of-concept that enabled the testing of launch and re-entry survivability, as well as basic functionality of the carbon nanotube switches on orbit throughout the shuttle mission,” explains a Lockheed Martin official. The NRAM devices, early prototype parts, performed consistently—before, during, and after completion of the mission. “This mission represents an important first step in the development of high-density, non-volatile, carbon-nanotube-based memories for spaceflight applications.” Lockheed Martin and NASA officials are working on plans for future NRAM flights.

Nantero engineers developed NRAM high-density, nanotube-based/nonvolatile RAM using proprietary technology derived from research. The proprietary NRAM design, invented by Thomas Rueckes, Nantero’s chief technology officer

Power on command

mPhase Technologies Inc. of Little Falls, N.J., won an Innovations Design and Engineering Award in the Portable Power category for its mPower Emergency Illuminator at the 2010 International Consumer Electronics Show (CES) in Las Vegas last month. The mPower Emergency Illuminator was also named an International CES Innovations 2010 Design and Engineering Awards Honoree in the Personal Electronics Design category.

“The mPower Emergency Illuminator is a precision instrument with a powerful 180 Lumens LED and two separate battery tubes,” describes a company representative. One tube holds two CR123 batteries for everyday use; the second tube carries mPhase’s Power On Command reserve battery that takes over after the CR123 batteries are spent, even after laying idle for 20 years. The Emergency Illuminator also sports a USB port for charging portable electronic devices.

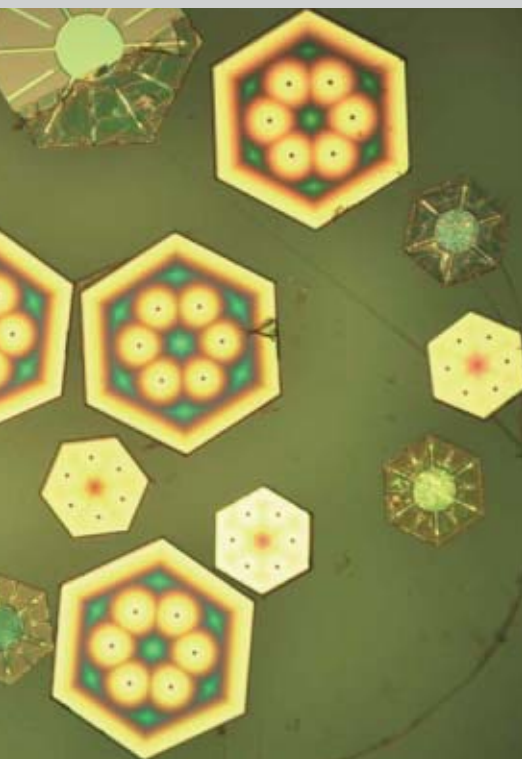
“This award spotlights the true importance of the Power On Command technology that makes the mPower Emergency Illuminator such a distinctive product,” says Ron Durando, chairman and CEO of mPhase Technologies. “Considering that the U.S. government is giving increasing priority and funding to alternative energy solutions, this is an important time to be recognized for new and innovative battery technology.”

The mPower Emergency Illuminator may hold value for defense, homeland security, first responder, and consumer applications.

For more information, visit mPhase Technologies online at www.mphasetech.com.



The mPower Emergency Illuminator, using mPhase’s nanobattery technology, won an Innovations Design and Engineering Award in the Portable Power category at the 2010 International Consumer Electronics Show.



TECHNOLOGY FOCUS

The NRAM design also combines nanotubes with traditional semiconductor technologies for manufacturability. NRAM can replace DRAM (dynamic RAM), SRAM (static RAM), and flash memory, and is expected to displace hard disk storage in the future.

"This demonstration of carbon-nanotube-based semiconductor devices in the rigorous conditions of space is an important step towards a whole new suite of future applications," says Dr. Jim Ryder, vice president and general manager of the Lockheed Martin Advanced Technology Center in Palo Alto.

Lockheed Martin is dedicated to the research, development, and application of nanotechnology to future government applications, Ryder adds. Direct benefits of



From left to right, Sandia researchers Murat Okandan, Greg Nielson, and Jose Luis Cruz-Campa hold samples containing arrays of micro-solar cells. (Photo by Randy Montoya.)


and co-founder, employs carbon nanotubes as the active memory elements.

Carbon nanotubes not only offer the ability to conduct electricity as well as copper, but also are stronger than steel and as hard as diamond, says a company representative.

nanotechnology for government customers could include stronger, lighter, and less expensive materials; more capable systems; and enhanced personal protection for military and first responders.

Aerospace imaging

NASA officials, continuing to further nanotechnology and MEMS development



Part Number	Total Channels	Common Voltage Channels	Kelvin Measurement *	Transorb ESD Protection	Address Busses	Enable Lines	Total Dose krad(Si)	SEU immune >MeV-cm ² /mg	DSCC SMD Number
MANY-MUX									
MUX8500	64	32	32	■	2	4	300	120	5962-0050201KXC
MUX8501	64	64		■	2	4	300	120	5962-0050202KXC
MUX8502	48		48	■	1	3	300	120	5962-0323401KXC
MUX8503	48	48		■	1	3	300	120	5962-0323403KXC
MUX8506	48		48		1	3	300	120	5962-0323402KXC
MUX8508	32	32		■	2	2	300	120	5962-0822601KXC
MUX8510	64	32	32	■	2	4	150	90	5962-0920201KXC
MUX8511	64	64		■	2	4	150	90	5962-0920202KXC
MUX8512	48		48	■	1	3	150	90	5962-0920301KXC
MUX8513	48	48		■	1	3	150	90	5962-0920302KXC
MUX8518	32	32		■	2	2	150	90	5962-0920401KXC
MINI-MUX									
MUX8520	16	16		■	1	1	300	120	5962-0922901KXC
MUX8521	16		16	■	1	1	300	120	5962-0922902KXC
MUX8522	32	32			2	2	300	120	5962-0923101KXC
MUX8523	32	32		■	2	2	300	120	5962-0923102KXC
MUX8530	16	16		■	1	1	150	90	5962-0923001KXC
MUX8531	16		16	■	1	1	150	90	5962-0923002KXC
MUX8532	32	32			2	2	150	90	5962-0923201KXC
MUX8533	32	32		■	2	2	150	90	5962-0923202KXC
COMING 2010 +5V ONLY									
MUX8561	16		16		1	1	150	90	Pending
MUX8562	32	32			2	2	150	90	Pending

*Kelvin voltage and current (4 wire). Kelvin measurement channels utilize two Muxes per channel. One Mux steers a forced constant CURRENT input to the remote resistive sensors. The second Mux multiplexes the returned VOLTAGES produced by the sensors.

HiRel Off-the-Shelf Analog Multiplexers

Available from **Aeroflex Plainview** — the most extensive line of HiRel Muxes! Our legacy 8500/8510 Series has been expanded with the introduction of our Mini-Muxes. Built-in de-coupling capacitors, current limiting resistors, and transorbs for ESD protection simplify your sensor telemetry design while saving you power, space and weight.

- 16, 32, 48, and 64 channels
- 8500/8510 Series: 1.32" square
- Mini-Muxes: 0.80" square
- High analog input impedance
- Optional Kelvin capable channels
- MIL-PRF-38534 Class K MCM

www.aeroflex.com/MUXMA
800-645-8862



» TECHNOLOGY FOCUS

and application, have partnered with Boston Micromachines Corp., a provider of MEMS-based deformable mirror products for adaptive optics systems, in Cambridge, Mass.

Boston Micromachines won two NASA Phase I SBIR contracts, totaling roughly \$200,000, to further space imaging research.

The first Phase I project is to develop a compact, ultra-low-power, high-voltage multiplexed driver suitable for integration with Boston Micromachines's deformable mirrors in space-based, wavefront control applications. "This project, a collaboration between Boston Micromachines and Boston University, aims for a driver to be produced with a minimum hundred-fold reduction in power consumption and a tenfold reduction in size while maintaining high precision and decreasing cost interconnection complexity," a representative describes.

"The second Phase I project involves an enhanced fabrication process for high actuator count deformable mirrors, required for wavefront control in space-based high contrast imaging instruments. This manufacturing process is expected to overcome current scalability issues associated with fabricated, polysilicon surface micromachined MEMS deformable mirrors. By expanding the size of deformable mirror devices, space imaging instruments will be able to shape more light using less hardware and less stages," explains a representative.

Boston Micromachines' devices, integrated into commercial adaptive optics systems, apply wavefront correction to produce high-resolution images, and to enhance images blurred by the earth's atmosphere. The company's advanced MEMS-based mirrors drive scientific discovery in astronomy, laser beam shaping, microscopy, and vision science, and support a variety of defense applications. Customers include NASA, the University of California-Berkeley, Lockheed Martin, and Boston University.

"These SBIRs mark the seventh and eighth contracts from NASA through the SBIR program," says Paul Bierden, president and co-founder of Boston Micromachines. "Our technology continues to help

advance the search for extrasolar planets, which has emerged as a compelling, long-term scientific goal for NASA."

Microsolar MEMS

Scientists at Sandia National Laboratories in Albuquerque, N.M., have developed glitter-sized photovoltaic cells that could revolutionize the way solar energy is collected and used.

Sandia lead investigator Greg Nielson



Sandia project lead Greg Nielson holds a solar cell test prototype with a microscale lens array fastened above it. Together, the cell and lens help create a concentrated photovoltaic unit. (Photo by Randy Montoya.)

and his colleagues in the research team expect the microphotovoltaic cells, which are fabricated using microelectronic and microelectromechanical systems techniques, to improve performance, reduce costs, and increase efficiencies in current and new applications.

"Eventually units could be mass-produced and wrapped around unusual shapes for building-integrated solar, tents and maybe even clothing," Nielson predicts. These miniature cells could make it possible for military personnel in the field to recharge batteries for phones, cameras, and other electronic devices as they walk or rest.

Microengineered panels could also be imprinted with circuits, enabling the performance of additional functions, Nielson says. Other possible applications include satellites and remote sensing.

Microphotovoltaic cells are well suited to military applications, in which size, weight, power, and cost are important considerations. These MEMS devices would take up little space, harvest and store power, and potentially reduce costs because "microcells require relatively little material to

form well-controlled and highly efficient devices," according to a Sandia official.

"They use 100 times less silicon to generate the same amount of electricity," says Sandia researcher Murat Okandan. In fact, electricity can be harvested from the Sandia-created cells with 14.9 percent efficiency, whereas commercial off-the-shelf (COTS) modules range from 13 to 20 percent efficiencies.

"Since they are much smaller and have fewer mechanical deformations for a given environment than the conventional cells, they may also be more reliable over the long term," Okandan adds.

These MEMS-based cells are the product of the combined efforts of: Sandia's Microsystems Center; Photovoltaics and Grid Integration Group; and Materials, Devices, and Energy Technologies Group; as well as the National Renewable Energy Lab's Concentrating Photovoltaics Group in Golden, Colo. This work is also supported by the U.S. Department of Energy's Solar Energy Technology program and Sandia's Laboratory Directed Research & Development program.

Sandia National Laboratories is a government-owned/contractor-operated multiprogram laboratory. Sandia Corp., an autonomous Lockheed Martin company, manages Sandia National Laboratories for the U.S. Department of Energy's National Nuclear Security Administration.

Nanobatteries

Today's military missions require an ever-increasing amount of electronics, driving the need for safe and reliable power able to withstand the rigors of the battlefield. Batteries based on nanotechnology, offering small size and potentially low cost, present a compelling argument for mil-aero applications.

Engineers at Altair Nanotechnologies Inc. (Altairnano) in Reno, Nev., designed the company's advanced lithium-ion battery systems to meet specific power and energy requirements for a range of military applications, such as weapons systems, combat vehicles, ships, data centers, and military micro-grid applications.

The devices are engineered to deliver safety, reliability, availability, and long-term performance in extreme temperature

TECHNOLOGY FOCUS

and environmental conditions, as well as to help the military achieve renewable energy goals and reduce downtime and maintenance costs, says a representative.

Altairnano engineers are researching nanosensors for the U.S. Army, as part of an agreement with the U.S. Army Research, Development, and Engineering Command (RDECOM) Acquisition Center that runs through September 2010 and is worth as much as \$1.75 million.

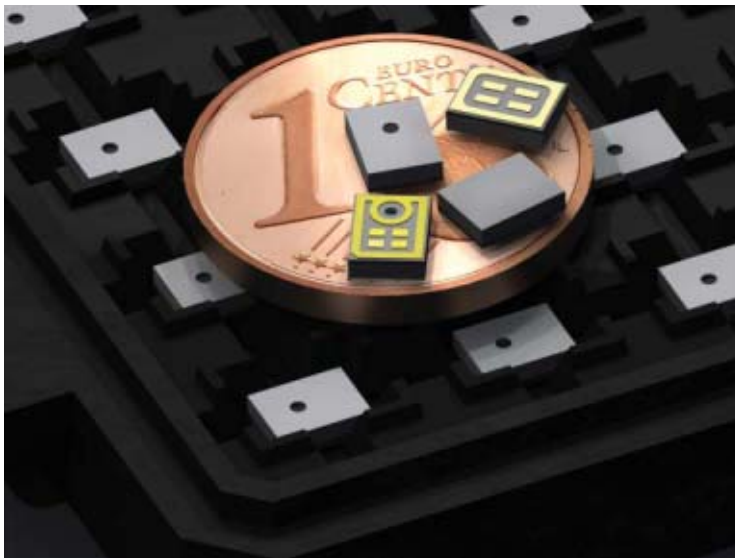
Altairnano personnel are researching sensitive and selective nanosensors to determine how single sensing molecules combined with nanoparticles respond to airborne nerve agents and toxic industrial chemicals. The goal is to incorporate nanosensors in portable sensing devices capable of protecting soldiers from the threat of chemical weapons.

"This is another important milestone in our work with the military," Terry M. Copeland, Altairnano's CEO, acknowledges. "We believe Altairnano's technologies are uniquely positioned to help the U.S. Army in the development of portable, life-saving sensors that could one day be utilized on the battlefield."

Nanoscale for the Navy

Altairnano is involved in several military projects geared toward more sturdy, efficient, compact, and cost-effective power electronics.

The company's advanced energy storage and battery systems—which replace traditional graphite materials used in conventional lithium-ion batteries with a proprietary, nano-structured lithium titanate—have been adopted by the U.S. Department of Defense and the United Kingdom Ministry of Defense. Applications include battery backup systems that replace diesel turbine generators on U.S. Navy vessels like the Arleigh Burke class destroyer; batteries for light-weight gun digitization, including the U.S. Army M119 howitzer; and a battery system



MEMS manufacturer STMicroelectronics in Geneva, Switzerland, introduced microphones equipped with MEMS sensor technology from Kyoto, Japan-based Omron Corp., that are less susceptible to mechanical vibration, temperature variations, and electromechanical interference than traditional electret condenser microphones.

for submarine power and propulsion.

Altairnano won a \$3.8 million contract from the Office of Naval Research for Phase II of a shipboard uninterruptible power supply (UPS) system. The U.S. Navy program is focused on developing, testing, and deploying 2.5-megawatt stationary power supply systems for naval destroyers. Altairnano officials anticipate development of a safe, less costly, and environmentally sustainable substitute for back-up fuel turbines, resulting in an annual fuel cost savings in excess of \$1.5 million per ship and

960 metric tons of carbon reduction annually per ship.

Long-life lessons

U.S. Army officials have renewed a Phase II Small Business Technology Transfer (STTR) Grant originally awarded to mPhase Technologies Inc. in Little Falls, N.J., in September 2008 through the SBIR program. The two-year grant enables mPhase engineers to continue developing the Smart NanoBattery through September 2010. The goal is a compact, multi-cell, three-volt, lithium-chemistry, micro-arrayed battery with a minimum 20-year shelf life and uninterruptible power output during the same period.

Engineers at mPhase have, over the past 12 months, built

a functional lithium Smart NanoBattery prototype for a computer memory application. Upon completion of the program, mPhase officials plan to enter production and commercialize the battery technology.

Engineers at mPhase Technologies and the Energy Storage Research Group (ESRG) at Rutgers University in Piscataway, N.J., are working together on the project.

Military nanotechnology

Current military electronics applications require power electronics and power

COMPANY INFORMATION

AeroVironment Inc.

Monrovia, Calif.
www.avinc.com

Air Force Research Laboratory (AFRL)

Wright-Patterson Air Force Base, Ohio
www.afrl.af.mil

Altair Nanotechnologies Inc. (Altairnano)

Reno, Nev.
www.altairnano.com

Boston Micromachines Corp.

Cambridge, Mass.
www.bostonmicromachines.com

Energy Storage Research Group (ESRG) at Rutgers

Piscataway, N.J.
<http://mase.rutgers.edu>

Lockheed Martin Nanosystems,

a business unit of Lockheed Martin Space Systems Company
Palo Alto, Calif.
www.lockheedmartin.com

Luna Innovations Inc.

Roanoke, Va.
www.lunainnovations.com

mPhase Technologies Inc. AlwaysReady Inc.

Little Falls, N.J.
www.mphasetechn.com

Nanocomp Technologies Inc.

Concord, N.H.
www.nanocomptech.com

Nantero Inc.

Woburn, Mass.
www.nantero.com

Natick Soldier Center

Natick, Mass.
www.natick.army.mil

National Renewable Energy Lab

Golden, Colo.
www.nrel.gov

Omnetics Connector Corp.

Minneapolis
www.omnetics.com

Sandia National Laboratories

Albuquerque, N.M.
www.sandia.gov

Via Technologies Inc. USA

Fremont, Calif.
www.via.com.tw

TECHNOLOGY FOCUS

supplies that are not only small, safe, and reliable, but also rugged.

Officials at AlwaysReady Inc., a subsidiary of mPhase Technologies in Little Falls, N.J., have revealed that the company's Smart Nanobattery structure survived a 50,000 G-force test at the U.S. Army's Picatinny Arsenal in New Jersey.

During the test, several Smart Nanobattery prototypes were shot from an air-gun simulator at a force calculated to be greater than 50,000 Gs. Officials confirmed that the batteries continued to function and generate the expected electrical output following the test.

"This test demonstrated that the physical

Carbon nanotubes

Carbon nanotubes (CNTs) are tiny, cylindrical carbon molecules 1/50,000th the diameter of a human hair that possess electrical and structural properties. The word "nanotube" is from nanometer (approximately 10 carbon atoms) and tubular (shape of a rolled up sheet of graphene that forms a CNT). CNTs are half the density of aluminum, 50 times stronger than steel, thermally stable in vacuum up to nearly 3,000 degrees Celsius, efficient conductors of heat, and may be either metallic or direct bandgap semiconductors. (Courtesy Lockheed Martin and Nantero.)

structures, although micro-sized, are durable enough to withstand the most rugged conditions," says Steve Simon, executive vice president of research and development at AlwaysReady.

The test was part of a Cooperative Research and Development Agreement (CRA-DA) with researchers at Picatinny with the goal of using nanobatteries to power next-generation armaments and small guided munitions.

Smart Nanobattery architecture from mPhase/AlwaysReady is designed to deliver an energy source that has a decades-long shelf life and can be activated on demand for defense and other applications.

Promising progression

"The future of nanotechnology and MEMS is moving out of labs and into production," Nanocomp's Antoinette says. "Nanotechnology is through the incubation phase and in a true commercial phase, as companies like Nanocomp scale up to offer large volumes with attractive pricing. In general, this is the next step for nanotechnology. We are working on that, and planning to bring manufacturing online this year."

Cost-reduction efforts pose a big challenge, Omnetics' Jones explains, because "the use of MEMS technology does not yet have large commercial applications to offset the cost of development. Yet, there are a number of initiatives to meet the challenges of processing MEMS technology, funded by both private industry and the government, to further its development and applications. I fully expect this development to continue well into the future." ●

www.mskennedy.com

Three Phase BLDC Motor Drivers

Potent Power!

Compact, High Reliability

MSK 4354
600 Volts, 10 Amps
Boot Strap
High Side Supply

MSK 4351
600 Volts, 50 Amps
Fully Isolated
Smart Power
3-Phase Motor Driver

MSK 4310
Complete Closed Loop
Speed Controller
55 Volts, 10 Amps

MSK 4301
75 Volts, 29 Amps
100% Duty Cycle
Capable

*Certified to
Class K & Class H
MIL-PRF 38534*

M.S. Kennedy Corporation

4707 Dey Road, Liverpool, New York 13088
315-701-6751 • www.mskennedy.com

OPINION

3D IC integration is poised to drive the next generation of military imaging sensors

IC bonding technology will enable design engineers to stack semiconductors—not scale them—to improve the performance of image sensor arrays

BY CHRIS SANDERS

As military and aerospace design engineers develop imaging systems for the wired battlefield of tomorrow, they face the challenge of providing high-resolution imaging arrays that are light, small, and cheap, yet that can deliver the high resolution necessary for imaging systems ranging from surveillance cameras in unmanned aerial vehicles (UAVs) to satellite imaging systems, to infrared night-vision goggles.

In the commercial semiconductor industry, chip makers continually look for new ways to shrink the sizes of their devices. The traditional path of commercial semiconductor development has been to thin-down line widths for integrated circuits (ICs)—from 1.25 micrometers, to 90 nanometers, to 45 nanometers, and down to today's 32 nanometers nodes and beyond.

With each step down in IC scaling, however, the development costs increase exponentially and the technical challenges get harder to solve. The primary drivers for 3D integration in the commercial arena involve increasing the interconnection density (the ability to pack more transistors and more functionality onto an IC), optimizing manufacturing yields (ensuring that high volumes of semiconductor wafers can be processed efficiently with few defects), and reducing costs (which relates to manufacturing yields in that more wafers can be produced more cost effectively in a given production cycle).

While these factors also have an influence in the development process for military and aerospace semiconductors, the primary advantage of 3D IC integration for imaging

sensors in defense electronics is the ability to achieve high-performance imaging arrays using proven and less costly IC technology (i.e., 90 nanometers and higher).

Backside illumination

In a traditional CMOS imaging sensor array, the image sensor is a matrix of photodiodes and color filter elements designed to capture light (photons), and the control circuitry is formed on a layer above this

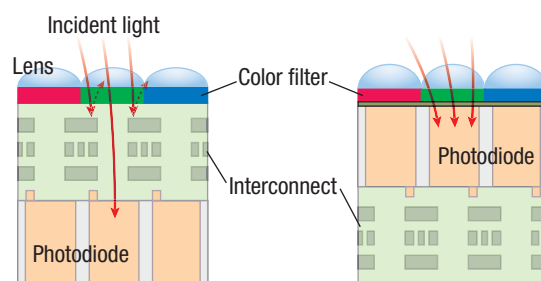


Figure 1 shows front-side and back-side illumination wafer cross-sections.

matrix. Using this front-side illumination (FSI) technique, a portion of the light that should enter the image sensor is refracted, blocked, or otherwise distorted by the metallized dielectric elements of the control circuitry, thus reducing the image sensor's performance.

Using a back-side illumination (BSI) design moves the control circuitry to the reverse side of the chip containing the photodiode/lens/filter array, and thus enables 100 percent of the image sensor to be used for light capture. Implemented through the use of 3D IC integration, this type of BSI architecture delivers reduced pix-

el size, increased low-light sensitivity, enhanced quantum efficiency and reduced cross talk, which in turn lead to significant improvements in sensor performance and image quality, as well as reduction in cost. BSI technology provides superior low-light sensitivity and enables flatter lenses to be used, which makes for thinner camera and image sensing modules.

Vertical interconnections

Because the processing steps are different for the sensor array wafer and the control circuitry wafer, it is necessary to find a way to join the separately-processed elements together, electrically and mechanically. There are three enabling technologies critical to the ability to stack semiconductor layers and form the structures necessary to produce a multi-layer design required to implement a next generation BSI CMOS image sensor.

Because they are built a few microns into the silicon substrate and do not impede the conventional interconnect routing, these TSVs are easily scalable. When the wafers are thinned to reveal the TSVs, they can either be bonded "as is," or a bonding metal, such as nickel, copper, or other suitable material may be patterned on top of the revealed TSV and planarized (made smooth) with oxide deposition and CMP in preparation for bonding. TSVs can also be formed after the primary IC processing is completed by etching through the wafer layers to expose metal columns that extend through the backside of the wafer.

The second enabler is wafer thinning technology. To implement BSI designs, typically the wafer carrying the photodiode arrays must be thinned to expose the interconnects (TSVs) on the device's backside prior to bonding. Wafer thinning typically involves mechanical grinding of the wafer's back surface, and/or chemical polishing to produce a smooth surface. For silicon wafers with embedded metal, it is important

OPINION

to consider that the bonding metal, especially copper, is typically softer and more ductile than the surrounding silicon and the polishing process can result in “dishing” or a non-planar surface, which complicates bonding.

The third enabling technology is a reliable, low-cost wafer bonding process, which is the most technically complex challenge for semiconductor manufacturers to overcome. The ideal bonding technology would be scalable

for 3D interconnect for either wafer-to-wafer or die-to-wafer fabrication processes.

Different approaches to bonding

The challenge of developing a reliable, repeatable, low-cost bonding technology has resulted in three different methods for wafer-level bonding today: 1) Metal-to-metal thermocompression bonding;

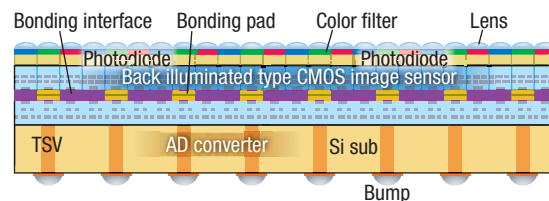


Figure 2 shows a complete BSI CMOS imaging wafer with A/D converter as the bonded control circuit wafer.

2) Conductive and non-conductive polymer adhesives; and 3) Direct oxide bonding (also known as “fusion,” “covalent,” or “molecular” bonding). Each of these processes has both advantages and limitations for BSI CMOS imaging sensors.

Thermocompression bonding

Metal-to-metal thermocompression bonding has been the preferred technology for early efforts in 3D IC integration; experts prefer it because it forms mechanical and electrical interconnections simultaneously. This process bonds the exposed metal surfaces of previously formed TSVs with temperatures from 350 to 450 degrees Celsius, as well as 30 minutes under pressure.

This process has its drawbacks. Elevated temperature limits the alignment accuracy of most thermocompression processes to 1.8 to 2 microns. In addition, the need for separate temperature and pressure chambers to complete the bonding process adds significant processing time, which directly influences processing costs. High temperatures and pressure on CMOS imaging sensors also can distort the image sensor elements of the wafer.

Polymer adhesives

Another technology that has been used for 3D IC integration involves applying conductive and non-conductive polymer adhesives to different wafer levels, aligning the wafers, and placing them in specialized process chambers for curing. This approach can require 30 to 60 minutes per wafer, and as many as four process chambers, with a throughput capacity of four to eight wafers per hour in each chamber. Current alignment technology limits the bonding accuracy to 1.8 to 2 microns, which can affect yields and increase processing costs.

Direct oxide bonding

Employing direct oxide bonding (also referred to as “covalent” or “molecular” bonding) creates vertical metal-to-metal interconnection between wafer layers with

CERTIFIED REBALLING SERVICES

ISI has more than 8 years experience in ball attach, removal and replacement. The ISI process was developed to minimize the stress that BGAs are subjected to at each process step. This refined process enables us to certify every shipment to the following:



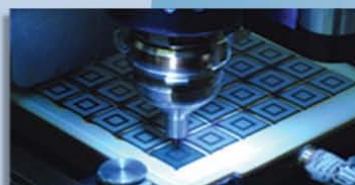
We **certify** that your parts are protected through the process to IPC/JEDEC J-STD MSL Classification as required by the semiconductor supplier.

We **certify** that the process we use for ball removal will protect the silicon and it will never be subjected to a time temperature cycle above 50% of the supplier's recommended cycle.

We **certify** that the ball attach process will be performed in a nitrogen environment in a conducting convection oven and will never exceed 90% of the time temperature recommended by the supplier.

We **certify** we will 100% optically inspect the reballed parts to ensure the device meets the original supplier's specifications for flatness and coplanarity.

The ISI reballing process has been qualified by leading Commercial, Industrial, Military and Aerospace companies.



ISI Interconnect Systems Inc.

www.isipkg.com
(805) 482-2870

OPINION

non-conductive heterogeneous oxide (SiO₂) to activate chemical bonds between exposed conductive materials on each wafer's surface. By preparing the planarized wafer surfaces with the oxide, the formation of chemical/molecular bonds is enabled at significantly lower temperatures, thus eliminating the high temperature and pressure.

To achieve 3D IC stacking, experts planarize the top and bottom of the wafers before bonding to expose the metal TSV interconnections. The topside contacts are bonded to the backside, which has been thinned to expose the bottom of the next layer TSVs or top-side of the next level wafer. Alternatively, wafer surfaces can be prepared by seeding a metal layer on top of the TSV structures, then depositing an oxide layer.

Nickel is often used for this metal layer, since its hardness facilitates the CMP (chemical-mechanical planarization) process. Copper can also be used, however; adjustments to the CMP process are required to mitigate "dishing" that can otherwise occur as the softer copper undergoes CMP. When the surface is flattened through CMP processing to expose the TSV metal and SiO₂ coplanar surface, the room temperature bonding process can occur.

The bonded structures may then be heated for a short period to reinforce and enhance the 3D interconnections. The optimum temperature depends on which bonding metal is used. For example, nickel may need heating to about 300 degrees C, while copper will only require about 150 degrees C or less to form monolithic low-resistance metal-to-metal interfaces. The activated and terminated oxide layers bond with sufficient energy to generate internal pressure when the DBI metal expands with the increase in temperature to form a reliable metallic bond to complete the interconnection.

The advantages of direct oxide bonding include processing time per wafer of three to six minutes, and increased alignment accuracy; current technology enables bond accuracy to within 1.2 microns, with improvements expected to tighten that to 0.5 microns or better. In addition, it is possible to achieve several layers of integration using direct oxide bonding without compromising yields. More importantly for CMOS imaging sensors, the direct oxide bonding process does not create additional distortion in the finished focal plane array.

Another significant advantage is the option of using more established and often less expensive 1.25-micron or 90-nanometer semiconductor technology for the sensor control circuitry, without compromising performance, density, or cost.

Application to military imaging

The ability to place the entire signal processing circuitry directly on the active side of a CMOS wafer enables improved processing speeds as well as reduced manufacturing costs by allowing the use of older and less expensive CMOS technology. Another benefit is dedicating 100 percent of the surface area of the pixelated sensor array, to image capture, which improves resolution and creates a compact, high-performance sensor.

Military applications of this technology include UAV guidance and surveillance cameras; satellite imaging systems; airborne imaging systems; infrared imaging systems, such as missile guidance, night-vision, and security systems; millimeter-wave radar; and remotely deployed or soldier-carried battlefield cameras. ●

Chris Sanders is director of business development at Ziptronix Inc. in Morrisville, N.C., which specializes in 3D semiconductor manufacturing. Learn more about the company online at www.ziptronix.com.

Fischer UltiMate™ Military Connectors Line

Secure Connections for
UltiMate Protection



New

LandForce™ Series
Compact, Rugged, Lightweight

- Excellent sealing IP68/69K even unmated
- Rugged design for harsh environment
- Extremely robust mechanical keying
- Miniature and ultralight design
- Push-pull locking or emergency release system
- EMC 360° high performance shielding
- High shock and vibration resistance
- 10,000 mating cycles
- Wide range of configurations
- Easy Fischer cable assembly solutions



www.fischerconnectors.com

Fischer Connectors, Inc.

1735 Founders Parkway

Alpharetta GA 30009

Tel: 800.551.0121

Fax: 678.393.5401

mail@fischerconnectors.com

Visit Us at AUSA Winter Symposium, Booth #438





PRODUCT INTELLIGENCE

Trends in microprocessors: high-end military embedded applications are beginning a shift to Intel

By **JOHN KELLER**

When it comes to military embedded computing, basically only two microprocessor manufacturers slug it out for the lion's share of the defense and aerospace embedded computer market—Freescal Semiconductor Inc. in Austin, Texas, and Intel Corp. of Santa Clara, Calif.

While Freescale has been this market's 500-pound gorilla for some time, Intel's latest introduction of its Core i7 microprocessor in January is tipping the defense embedded systems community on its head in a transformation the likes of which seasoned observers have not seen in years.

The newest Core i7 "is unlike anything we've got," says Frank Willis, director of military and aerospace product development at GE Intelligent Platforms in Albuquerque, N.M. "It's going to set the standard for performance as we move ahead. This gives Intel unbelievable capability and entry into the market."

Sure, there are plenty of other important microprocessor makers—Advanced Micro Devices Inc. (AMD) of Sunnyvale, Calif.; ARM Inc. of Los Gatos, Calif.; Cavium Networks of Mountain View, Calif.; and MIPS Technologies Inc. of Mountain View, Calif. among them—but

for military embedded applications, Freescale primarily, and to a lesser extent Intel, have been the processors of choice.

Of the leading two companies, Freescale by far has been the more dominant over the past several years based on its marquee embedded microprocessor, the Power PC (and later Power Architecture) with the AltiVec floating point and integer SIMD instruction set—for applications like radar, sonar, and signals intelligence that need floating-point processing.

The performance, flexibility, and power consumption of the Power Architecture has kept Freescale on the top of the mountain for a long time, and not just because of floating-point processing. The Power Architecture also fits well with the VME backplane databus that has dominated military embedded computing for much of the chip's reign.

Aerospace and defense systems designers, despite getting what they needed from Freescale, always wanted an alternative source of microprocessors, just in case Freescale changed their microprocessor architectures.

For a while, defense and aerospace embedded computer makers hung their hopes on a company in Santa Clara, Calif., called P.A. Semi as an alternative to Freescale. P.A. Semi

experts were developing a powerful and power-efficient Power Architecture processor called PWRficient, which met their needs. Hopes were dashed, however, when Apple Computer acquired P.A. Semi, and took P.A. Semi products off the open market.

Then the fears of high-end military systems designers were realized. Freescale, in a bid to dominate the cell phone and handheld appliance market, decided to abandon AltiVec and floating-point capability in its latest generation of microprocessors, which dropped a monkey wrench into long-term planning among the military embedded computing companies. "The Freescale PowerPC roadmap is dead-ended now at AltiVec," says Doug Patterson, vice president of marketing at Aitech Defense Systems Inc. in Chatsworth, Calif.

Then Intel quietly made it known that help was on the way; the company was working on a high-performance, low-power chip with floating-point capability. Embedded computer designers made plans to take advantage.

Intel formally altered the balance in January 2010 with its announcement of the latest-generation Core i7 microprocessor with floating-point capability. Several embedded computing products aimed at aerospace and defense applications were introduced within hours of the Intel Core i7 introduction, with additional products coming out nearly every day afterwards.

"The biggest feature of the Core i7 is the floating-point performance," says Ben Klam, vice president of engineering at Extreme Engineering Solutions (X-ES) in Middleton, Wis. "Now they are getting into lower-power embedded applications with good performance, which will help any military applications that benefit from floating point, like radar and signal processing."

None of this is to say that Freescale will not be part of aerospace and defense applications in the future; far from it.

Steve Edwards, chief technology officer at Curtiss-Wright Controls Embedded Computing in Leesburg, Va., says the military and aerospace embedded computing market essentially has three components—high-

COMPANY INFORMATION

Advanced Micro Devices Inc. (AMD)
Sunnyvale, Calif.
www.amd.com

aJile Systems Inc.
San Jose, Calif.
www.ajile.com

Altera Corp.
San Jose, Calif.
www.altera.com

AppliedMicro
Sunnyvale, Calif.
www.appliedmicro.com

ARM Inc.
Los Gatos, Calif.
www.arm.com

Atmel Corp.
San Jose, Calif.
www.atmel.com

Cavium Networks
Mountain View, Calif.
www.caviumnetworks.com

Cirrus Logic Inc.
Austin, Texas
www.cirrus.com

Coherent Logix Inc.
Austin, Texas
www.coherentlogix.com

Freescale Semiconductor Inc.
Austin, Texas
www.freescale.com

IBM Microelectronics
White Plains, N.Y.
www-03.ibm.com

Innovasic Semiconductor
Albuquerque, N.M.
www.innovasic.com

Intel Corp.
Santa Clara, Calif.
www.intel.com

Maxim Integrated Products Inc.
Sunnyvale, Calif.
www.maxim-ic.com

Maxwell Technologies Inc.
San Diego, Calif.
www.maxwell.com

MIPS Technologies Inc.
Mountain View, Calif.
www.mips.com

Renesas Technology America Inc.
San Jose, Calif.
<http://america.renesas.com>

Texas Instruments
Dallas
www.ti.com

ZiLOG Inc.
San Jose, Calif.
www.zilog.com

end digital signal processing (DSP) applications; general-purpose processing; and low-power mobile applications.

Edwards says Intel may well come to dominate military DSP applications in the near term because of the Core i7's floating-point capability, yet he sees continued vigorous competition between Intel and Freescale in general-purpose processing and low-power embedded computing applications.

General-purpose processing in aerospace and defense applications "is split between the Power Architecture and Intel," Edwards says. "We see a huge market for the Freescale Power Architecture for highly integrated applications that need multiple cores, Ethernet controllers, and very small-footprint solutions."

General-purpose processing applications moving into the Intel camp, meanwhile, favor Intel's tie-in with the Windows desktop operating system, other commercial software with familiar man-machine interfaces, and embedded Linux, he says.

Low-power applications such as man-portable systems and small unmanned aerial vehicle (UAV) payloads also should remain a tosup between Intel and Freescale in the future, Edwards says, as both companies offer equivalent products.

In high-end DSP applications, however, aerospace and defense systems designers are coming out with distinct preferences for the new Intel microprocessor. "The bar for this capability has been set," says GE's Willis. "You will have to see Freescale step up to this level to stay competitive." ●

General Dynamics Itronix products are preloaded with Microsoft Windows Vista® Business



Rugged computers go where you go.

And you go from the peaks of frigid mountains to the baking heat of barren deserts to the humid rain forest; you travel there by land, air and sea over challenging terrain.

Featuring DynaVue® Outdoor Viewable Display Technology

At General Dynamics Itronix our sole purpose for more than 20 years has been designing and building innovative rugged computing products. From the world's lightest full-sized rugged notebook to a fully-rugged, full-featured notebook that weighs less than 2 pounds and fits in the palm of your hand, our products are built to perform in the most demanding environments.

For information on how to buy now please call Buy Rugged at 888-204-0214. For product information please visit us at www.gd-itronix.com.

GENERAL DYNAMICS
Itronix

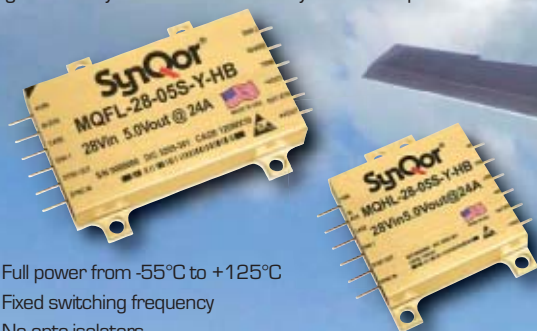
promo code 190

© 2009 General Dynamics. All rights reserved. Product or service names are the property of their respective owners. Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

SynQor brings high efficiency to the military.

MilQor® Hi-Rel DC/DC converters and filters

Featuring synchronous rectification for > 90% efficiency to meet the high reliability needs of the military and aerospace market.



- Full power from -55°C to +125°C
- Fixed switching frequency
- No opto-isolators
- Parallel operation with current share
- Clock synchronization; remote sense
- Primary and secondary referenced enable
- Continuous short circuit and overload protection
- Conduction cooled mechanical packaging

SynQor®

synqor.com/ma

Advancing The Power Curve®

978.849.0600

Made in USA



ELECTRO-OPTICS WATCH

Pentagon seeks to build airborne infrared sensor for ballistic missile defense

By **JOHN KELLER**

WASHINGTON—Leaders of the U.S. Missile Defense Agency (MDA) in Washington are trying to develop an airborne infrared sensor system within the next five years that is capable of tracking and intercepting en-



Missile Defense Agency officials want to be able to counter ballistic missiles like this one with airborne infrared sensors.

emy ballistic missiles in boost phase at or near engine burnout.

MDA issued a request for information (RFI) to industry, colleges, and government laboratories to determine the potential for developing airborne infrared (ABIR) sensor capability for fire-control-quality tracking of ballistic missiles at the end of the missiles' boost phases to support early intercept. Data could be handed off to anti-

missile systems like the Airborne Laser.

MDA officials want to understand if existing aircraft and infrared sensors could be modified and integrated to create a turreted, pod, or open-cavity airborne infrared system in less than five years to support ballistic missile defense.

First, MDA officials want to know what is the possibility of equipping 15 manned and unmanned aircraft to perform the airborne infrared missile defense mission by 2015.

Next, they want to understand the challenges of mounting a turreted electro-optical/infrared sensor pod as long as 22 inches and as heavy as 260 pounds to a manned or unmanned aircraft.

MDA officials also are interested in an infrared sensor pod for mounting to the tops of aircraft. The sensor pod should measure three feet in diameter, eight feet long, and weigh 1,100 pounds. Sensor pods must not interfere with satellite communications antennas.

For infrared sensors, MDA officials want

Continued on page 35

High-power laser on Avenger combat vehicle destroys IEDs in tests

By **JOHN KELLER**

HUNTSVILLE, Ala.—A laser weapon mounted on an Avenger combat vehicle destroyed 50 improvised explosive devices (IEDs) like those that kill U.S. service members in Iraq and Afghanistan during September testing, say officials of the Boeing Co., designer of the Avenger high-power laser.

The Avenger military laser destroyed large-caliber artillery munitions, smaller bomblets, and mortar rounds during tests Sept. 22–24 at Redstone Arsenal. A laser weapon mounted on an Avenger combat vehicle, shown at right, destroyed 50 improvised explosive devices (IEDs) during tests last September.



in Huntsville, Ala. These kinds of munitions typically are parts of IED systems. The Boeing Missile Defense Systems Directed Energy Systems unit in Huntsville, Ala., is developing the Avenger high-energy laser system.

Soldiers traveling with Laser Avenger did not have to get out of their armored vehicles or wait for an explosive ordnance disposal team to destroy an IED and continue their mission, Boeing officials say.

“Improvised explosive devices continue to threaten U.S. troops deployed in war zones, and Laser Avenger provides the ultra-precision,

Continued on page 34

Textron to provide armored vehicle with artillery-directing electro-optical payload

Textron Systems Corp. in Slidell, La., will provide the U.S. Army with 27 M1200 Armored Knight combat vehicle systems under terms of a \$10 million contract.

The M1200 armored vehicle is for Army artillery observers who help direct artillery fire with visual observations and with laser rangefinder and laser targeting equipment.



The groups that use the Armored Knight combat vehicles are called field artillery combat observation lasing teams, or COLTS for short. The M1200 tactical vehicle provides COLTs with increased armor protection, payload, and agility, over similar artillery directing vehicles based on the relatively light Humvee military vehicle. The vehicle uses the Knight precision targeting system from DRS Sustainment Systems in St. Louis, which blends laser designator/rangefinder, thermal imager, digital command and control, blended inertial/GPS navigation and targeting, and a self-defense weapon. The Knight electro-optical artillery directing system provides precision far target location and laser target designation for artillery close air support. The Knight payload provides the targeting for precision-guided munitions like JDAM and Excalibur. Awarding the contract were officials of the Army Tank-Automotive Command in Warren, Mich. For more information, visit Textron online at www.textronsystems.com.

Boeing unveils new display for flight simulation

Boeing released a new simulation display for flight training called the Constant Resolution Visual System (CRVS) at the Interservice/Industry Training, Simulation, and Education Conference (IITSEC) in Orlando, Fla. The CRVS creates an immersive environment by providing a high-resolution, out-the-window view for training systems and for general visualization applications. The CRVS's high-definition projector format is compatible with a variety of commercial off-the-shelf (COTS) projectors and a wide array of image generators. What makes it unique is that “it has con-

ENABLING PERFORMANCE BASED OPERATIONS



Conference and Exhibition
24th–25th March 2010
Passenger Terminal (City Centre)
Amsterdam, The Netherlands
www.avionics-event.com

REGISTER ONLINE AT
WWW.AVIONICS-EVENT.COM

PLEASE USE THIS
PROMOTIONAL CODE
WHEN REGISTERING:
MAE-0210

EXPLORE NEW FRONTIERS

Your invitation to the leading event for global commercial and defence avionics and defence electronics

International competition has intensified during a challenging economic atmosphere as companies and governments look to keep pace with next-generation avionics and air traffic management capabilities.

AVIONICS CONFERENCE TRACK INCLUDES:

- Avionics With ATM
- Performance Based Operations
- Regulatory Frameworks for Avionics
- Next Generation Military Avionics

DEFENCE ELECTRONICS CONFERENCE TRACK INCLUDES:

- COTS Integration Challenge
- Thermal Management
- Trusted COTS
- Software Defined Radio In Defence Applications

Exhibition Times

Wed 24th March: 10:00am – 6:00pm
Thurs 25th March: 10:00am – 4:30pm

Opening Keynote

Open and FREE of charge to all
Wed 24th March: 9:00am – 10:00am

Networking Reception

Wed 24th March: 5:30pm – 7:30pm

Exhibitor Presentations

Open and FREE of charge to all
throughout the exhibition
opening hours

If you are involved in the aviation electronics and defence electronics market, you cannot afford to miss Avionics Europe incorporating Defence Electronics.

For full conference programme or to register online visit www.avionics-event.com



Co-located with:



Flagship Media Sponsors:



Supporting Organisation:



Sponsors: **WIND RIVER**



» ELECTRO-OPTICS WATCH

Avenger from page 32

stand-off capability our warfighters need to-day to safely neutralize those threats," says Gary Fitzmire, vice president and program director of the Boeing Missile Defense Systems Directed Energy Systems unit. "In addition, Laser Avenger's versatility makes it useful in a wide range of battlefield conditions."


The U.S. Defense Department's Joint

IED Defeat Organization (JIEDDO) sponsored the test, which Boeing and the Army Program Executive Office for Missiles and Space conducted.

The test follows 2008 and 2009 demonstrations in which Laser Avenger shot down a small unmanned aerial vehicle in each event, and a 2007 demonstration in which an earlier version of Laser Avenger destroyed five targets representing IEDs

and unexploded ordnance.

Laser Avenger integrates a directed-energy weapon with the existing kinetic weapons on the Avenger air defense system. Laser Avenger is a Boeing-funded initiative to demonstrate that directed energy weapons are maturing and are relevant to today's battlefield.

For more information, visit Boeing online at www.boeing.com. 



stant resolution and looks the same on the edges and in the middle," said Mark McGraw, vice president, Boeing Training Systems and Support in St. Louis during a press conference. It uses high-definition projectors more efficiently—cutting down on the number needed and therefore on the price of the system, he added. The CRVS is also scaleable in terms of resolution, said Bruce Fasterling, director of business development at Boeing Training Systems and Services during the press conference. If an end-user has a limited budget and needs lower-cost projectors, the system's resolution can be scaled down, he added. Boeing engineers have been developing the CRVS as a company-funded project for several years. Applications include fast-jet, rotorcraft, and ground-based training, and visualizations for presentations, virtual prototyping, and analysis. The first CRVS will be production-ready in early 2010. The system has not been presented to any potential users yet, McGraw says.

Laser rangefinder for eye-safe laser military applications introduced by Premier

Premier Electronics Ltd. in Hoddesdon, England, is introducing a high-repetition, eye-safe laser rangefinder for military and aerospace applications with a range nearly 13 miles, depending on target and visibility. The laser rangefinder

er has an erbium glass laser with diode laser pumping in the 1.54-micron wavelength region. The receiver is an InGaAs APD, which is more expensive than germanium APDs but offers lower noise current, spectral response to 1700 nanometers, and higher-frequency bandwidth for a given active area, company officials say. A built-in video channel with aiming or projected outward reticule is for bore sighting with the systems sensors, which provides video information of reflecting target. The ranging resolution is 2.5 meters with several target dis-



crimination of 30 meters. Ranging logic is first, second, and last echo selectable. The unit measures 225 by 130 by 128 millimeters, weighs 4 pounds, and requires a power supply of 20 to 32 volts DC. Operating temperature is -37 to 65 degrees Celsius. Vibration and shock level are in accordance with MIL-STD-810F. For more information, visit Premier Electronics online at www.premierelect.com.

Armored fiber-optic cables for harsh-environment military applications introduced by JEM Electronics

JEM Electronics Inc. in Franklin, Mass., is



introducing a line of flexible, rugged fiber-optic cables for critical aerospace, military, automotive, industrial, and medical applications. The JEM ruggedized fiber-optic cable products, called Armored Fiber Optic Patch Cords, are designed to withstand twisting, kinking, crushing, and prevent rodent damage in applications where traditional optical fiber patch cables may fail during installation and operation. With a stainless-steel armored flexible tube inside the outer jacket and connectors, the rugged fiber-optic cables come in 9/125, 50/125, and 62.5/125 micron sizes and custom lengths for harsh environments. Available with SC, ST, MTRJ, FC, MU, E2000, SUS, and other connector types, JEM Armored Fiber Optic Patch Cords come in single- and multi-mode styles up to 500+ meters long. Insertion loss is 0.2 dB, return loss is less than or equal to 55 dB, and repeatability is less than or equal to 0.2 dB (single mode PC) and the stainless metal tube tensile strength is greater than or equal to 20 Kgf. The firm is ITAR certified, meet ISO 9001-2008, TS16949, and ISO13485 specifications, and are RoHS-compliant. For more information, visit JEM Electronics online at www.jemelectronics.com.

ELECTRO-OPTICS WATCH

Persistent surveillance with UAV-mounted infrared sensors is goal of DARPA ARGUS-IR program

By **JOHN KELLER**

ARLINGTON, Va.—Scientists at the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va., are asking industry to develop staring infrared sensors able to provide long-term persistent surveillance from unmanned aerial vehicles (UAVs).

The program is called Autonomous Real-Time Ground Ubiquitous Surveillance-Infrared (ARGUS-IR; DARPA-BAA-10-02) for persistent wide-area, high-resolution infrared surveillance. The ARGUS-IR system will combine sensor and sensor-processing subsystems to produce high-resolution video streams.

To do this, DARPA wants to develop wide-field-of-view IR airborne sensors to provide 24-hour surveillance with frame rates and resolutions able to detect and

track people on foot—particularly in cities at night. The sensor system must fit on Predator unmanned vehicles or smaller UAVs.

ARGUS-IR will provide real-time, high-resolution video surveillance over large areas at night, process sensor data on board, and transmit commands and data to remote operators at least five frames per second. Operators will control at least 65 independently steerable video streams.

The two components of ARGUS-IR will be a wide-field-of-view infrared sensor system, using long-wave infrared or mid-wave infrared spectral bands.

The infrared sensors must have minimum resolution of 200,000 pixels, upgradeable to 600,000 pixels in the program's third phase. The sensor must weigh less than 400 pounds, and use less than 1,000 watts of electricity.

The sensor processing system must be able to process 200 million pixels from an infrared focal plane array, with two basic modes: video windowing and moving target indication.

Sponsoring this program is the DARPA Information Processing Techniques Office. Initial proposals are due by 16 Feb. 2010, and final proposals are due by 16 July 2009.

For technical questions, contact the DARPA ARGUS-IR program manager, Brian Leininger, by e-mail at DARPA-BAA-10-02@darpa.mil, or by fax at 703-807-4907.

Additional information about the ARGUS-IR project is available online at <https://www.fbo.gov/spg/ODA/DARPA/CMO/DARPA-BAA-10-02/listing.html>. ●

AOptix demonstrates free-space optics laser communications for airborne HD video

CAMPBELL, Calif.—Scientists from the U.S. Air Force demonstrated high-bandwidth, real-time, free-space laser communications air-to-ground datalink from aircraft flying more than 60 miles apart using laser communications technology from AOptix Technologies Inc. in Campbell, Calif.

The demonstration was part of a two-phase flight test of the Enhanced Air-to-Ground Lasercom System (EAGLS) program of the Air Force Research Laboratory in Rome, N.Y., which a low-power, eye-safe laser, single bidirectional air-to-ground, free-space optics link to transmit live

simultaneous uncompressed high-definition (HD) video from two different airplane cameras at 2.5 gigabits per second.

For the demonstration, AOptix used pointing, acquisition, and tracking (PAT) technology with the company's aircraft-mounted R3.1 lasercom terminal and LCT-5 fixed-ground lasercom terminal, as well as advanced error correction in automatic clock recovery (ACR) and forward error correction (FEC) techniques.

"In-theater operations requiring real-time dissemination of persistent intelligence, surveillance, and reconnaissance information are no longer limited by the data rate constraints of today's radio-frequency (RF) networks," says Dean Senner, president and chief executive officer of AOptix Technologies.

The AOptix wireless bidirectional optical terminals use a single-aperture adaptive optics method of beam control

The AOptix air node, shown at left, uses free-space lasers to transmit data from moving aircraft.

to compensate for atmospheric turbulence while maintaining lock between two terminals, which move video, voice, and data through the air over one invisible, low-power, eye-safe, laser link.

For more information, visit AOptix online at www.aoptix.com. ●

Pentagon from page 32

to know wavebands, clear apertures, fields of view, noise equivalent irradiance, and frame rates, pointing errors, whether inertial measurement gyros are used, angular stabilization of the sensor's boresight, slew endurance, and settle time.

Concerning sensor processing, MDA officials want to know if suggested sensors have auto trackers able to track targets simultaneously against a uniform background. MDA officials also want to know how suggested sensors behave at altitudes above 35,000 feet.

The MDA contracting officer on this RFI is Elizabeth Moulder, who is available by phone at 256-450-1014, or by e-mail at Elizabeth.moulder@mda.mil. More information on this request for information is online at <https://www.fbo.gov/index?s=opportunity&mode=form&id=cef4ac037dd3d23888be0bc444132237&tab=core&cview=0>. ●



www.milaero.com

MILITARY & AEROSPACE ELECTRONICS | February 2010 | 35

NEAR SPACE SECURITY

24th – 25th March 2010
Amsterdam, Netherlands

CONFERENCE UPDATE

www.nearspacesecurity.com

Headline sponsors
agi
Analysis software for land, sea, air, & space
www.agi.com
CENTER FOR SPACE STANDARDS & INNOVATION

Co-located with



Flagship media sponsors



Owned and organised by



Dear Delegate

Your Invitation to Amsterdam – Register Today for Early Bird Savings

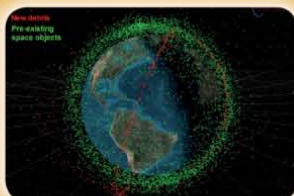
If you are involved in satellites or satellite-based services, then you need to plan your attendance at **NSS2010**. Near Space Security covers the safety of spacecraft in near Earth space. Topics will include debris, space weather, spacecraft protection, debris abatement, mitigation methods and more.

Everybody is involved. Everyone is concerned. Does someone have the solution? Concern is growing worldwide regarding the continued viability of the space domain. The results of a history of unrestrained launch and a corresponding growth in the hazards to space assets has been in the headlines across the globe. How are we, as a community, going to solve these problems in order to ensure a cost-effective access to space for our children? By bringing together experts from all fields, **NSS2010** strives to provide a platform for broad, cross-interest discussions on what can be done, what should be done and how it should be implemented. **NSS2010** has a comprehensive presentation schedule, planned to highlight the present state-of-the-art as well as current unresolved issues and proposed solutions to meet the community's current challenges.

We look forward to welcoming you to Amsterdam in March for the inaugural meeting place in Europe for Space Situational Awareness. Register before 27th January and benefit from the early bird discounts of up to 20% on standard full conference delegate fees. Complete the attached booking form or go online.

Adrian Broadbent
Conference Director

Tel: +34 91 804 2577
Email: abroadbent@aerospace-media.com



Register by 27th January Early Bird Savings

For more information or to register online visit www.nearspacesecurity.com

SPEAKERS INCLUDE





Emmet Fletcher is our main **CONFERENCE CHAIR** and speaker. Emmet is the Space Surveillance and Tracking Manager for the Space Situational Awareness Precursor Programme at European Space Agency (ESA). ESA are using NSS 2010 to discuss their SSA plans.



Ian Parker is one of the **CONFERENCE CHAIRS** (seen opposite in Zero G!). Ian became an aerospace journalist in 1980 and was appointed editor of the newly-launched Space magazine in April 1985 (see right). He edited that

publication till 2001 and has continued writing about Space for a wide variety of journals, has presented papers on the subject and has chaired conferences on various topics within the sphere. He has visited the space industry worldwide and witnessed launches from the Kennedy Space Center, ESA's launch site in Kourou, French Guiana, and the Baikonur Cosmodrome in Kazakhstan. He has met and interviewed key figures including Neil Armstrong, Buzz Aldrin and Alexi Leonov. Some years ago he had the pleasure of flying on the French Space Agency's zero-g astronaut training aircraft.



WEDNESDAY 24TH MARCH 2010

PLENARY SESSION

09:30 - 09:45

Welcome

Adrian Broadbent (Owner/Aerospace Media)



09:45 - 10:15

Conference Overview

Emmet Fletcher (Chair/ESA)



European Space Agency

10:30 - 12:00

VIP TBA

INTERNATIONAL PROGRAMMES

13:00 - 13:30

International Collaboration to Mitigate Space Debris: Issues and Some Answers.

Dr David Finkleman - Centre for Space Standards & Innovation



The objective of this paper is to address three critical aspects of the space debris problem. How debris mitigation and management practices might be established, demonstrated, and verified. What technical and administrative authorities might be responsible for implementation and validation? What criteria will be used to judge debris minimization and mitigation sufficiency?

13:30 - 14:00

Near Space Security - a common product for International cooperation and safety.

Fritz Muse - Independent Space Consultant



Following the recent collision of Kosmos 2251 and Iridium 33 and the potential for an increase in the frequency of such events, there is a burgeoning drive for improved international cooperation and transparency. National and Allied sensor groups know their own capabilities and sensitivities and are therefore loath to share too much information. This presentation proposes a global pool of satellite track information without compromising those individual sensor characteristics whilst providing for a far more accurate and sustainable picture of the Near Space Situation.

14:00 - 14:30

TBA

15:00 - 15:30

INTA - to follow

15:30 - 16:00

Two years of international cooperation on conjunction mitigation.

Dr T S Kelso, Senior Research Astrodynamist, Centre for Space Standards & Innovation



In an effort to mitigate the risks associated with satellite close approaches in the geostationary belt, several satellite operators came together in early 2008 to establish what is now known as the GEO Data Centre. The GEO Data Centre initially provided a framework for satellite operators to share orbital data for their fleets of satellites to be used to perform conjunction analysis and provide automated notification of close approaches via the SOCRATES-GEO system. After two years of operations, the GEO Data Centre now has 11 members providing data for 150 satellites. Since the Iridium 33-Cosmos 2251 collision, a parallel system was set up with a LEO Data Centre, which already has six members providing data for 106 satellites. These data centres have already shown the significant benefit of sharing orbital data, particularly in terms of reducing positional uncertainty and, thereby, the number of false alarms.

This paper will address the current framework for these efforts, highlighting how a service-oriented architecture is used to support orbital operations and increase efficiency of analysis and resolution of risk-mitigation tasks. It will show how the interactive work flow is used to quickly assess new manoeuvres to determine whether they have successfully reduced the chances of a particular close approach without causing other close approaches elsewhere. It will also show how independent space situational awareness organizations are being employed to provide a more complete picture of the threat from non-participating satellites and the debris population. Finally, a discussion of the ongoing research efforts to support further improvements in space situational awareness will be addressed.

16:00 - 16:30

Structure and status of the SDA and its Data Centre.

Stewart Sanders, Chairman of the Space Data Association and SVP, Customer Service Delivery at SES



A number of geosynchronous satellite operators have formed the Space Data Association Ltd. (SDA), a non-profit entity based in the Isle Of Man. The SDA will host a 'Data Centre' to enable sharing of data between operators in order to improve the space industry's management of satellite conjunction analysis and RF Interference.

This presentation will describe the reasons for, intent of, structure and status of the SDA and its Data Centre.

16:30 - 17:00

Round Table "International Cooperation - Challenges and Opportunities"

THURSDAY 25TH MARCH 2010

OPERATIONS

09:15 - 09:45

Lessons learnt and future challenges for a European Space Surveillance System.

Emmet Fletcher Space Surveillance and Tracking Manager; Space Situational Awareness Programme, European Space Agency



Work is progressing rapidly on the definition and development of Europe's independent Space Surveillance System. This discussion will highlight some of the important indicators that have shaped the system and how this will be developed in order to comply with the needs of all project stakeholders.

09:45 - 10:15

Space Situational Awareness (SSA) activities at the European Union Satellite Centre.

Juan-Luis Valero, European Union Satellite Centre (EUSC)



The development of an European Space Situational Awareness system will underpin the exploitation of space assets, a key capability contributing to autonomous access to space for the EU (as requested by the European Space Policy, drawing on existing capabilities and infrastructures at national as well as European level). The European SSA has the potential to be, in its operational phase, a dual use system of systems composed of various elements (civil and military, national and EU) distributing data to a variety of communities of public (civil and military) and private users. It will be based on specific and data fusion and distribution facilities. It would have a multilevel data flow with several levels of confidentiality and will be developed in an incremental manner with contributions from international partners. This model is very similar to the situation that the European Union Satellite Centre (EUSC) is experiencing in offering geospatial support to decision making in the field of CFSP – EDSP (Common Foreign and Security Policy – European Defence and Security Policy). The EUSC receives data from a variety of both public and commercial, civil and military, optical and radar data sources. It distributes products and provides services to a variety of end users with heterogeneous as well as very high security requirements. Finally the EUSC participates in a Network of entities (within the EU and its Member States as well as within third States and International Organizations) for both research and operational activities. Lessons learned during the development of complex space systems reveal that the handover from the R&D phase to operational phase is critical. The unique expertise of the EUSC in handling, analyzing and disseminating data and derived products within the highest security standards and mission critical cycles is viewed as a key asset for the development of a European SSA capability.

10:30 - 11:00

Full catalog conjunction assessment processing.

Robert Hall, Technical Director, Analytical Graphics, Inc.



Traditional methodologies for full space catalog maintenance employ monolithic architectures leveraging heritage algorithms. This paper proposes an innovative approach to full catalog maintenance which employs modern algorithms in a modular fashion. The overall architecture includes sensor observations

input and fusion, correlation and orbit determination along with conjunction assessment and automated covariance-based sensor re-tasking for refined estimates. These algorithms include a filter-based orbit determination approach that provides high-accuracy catalog data, which in turn permits a more accurate conjunction assessment capability ultimately benefitting the entire space community. The filter-based approach permits the fusion of multiple source tracking observations and the derivation of realistic covariance information, ensuring a high-accuracy catalog. Correlation of observations is performed in an automated fashion, significantly accelerating the time frame between break-up events and a true risk assessment understanding resulting from them. The authors will discuss the synthesis of sensor observations with high quality ephemeris from other sources, including from satellite operators (as available) to further improve overall catalog fidelity and ultimately, the integrity of the conjunction data. Lastly, the authors will describe an automated feedback loop to evaluate orbit accuracy, especially with respect to upcoming conjunctions, and efficiently task limited tracking resources so as to refine estimates and properly avoid further on-orbit collisions. This methodology leverages operational orbit ephemerides combined with future simulated tracking observations and the resultant predicted orbit uncertainties to determine which sensors should be employed to minimize uncertainties and enhance space situational awareness.

11:00 - 11:30

Operational tools, techniques and standards for space surveillance.

Francisco M. Martinez Fadrique, Technical Director, GMV



In the last years, activities in space surveillance have been continuously increasing. Several of these activities are very closely related to already developed and well consolidated technical areas in the space domain. GMV has successfully applied existing elements, knowledge, tools and techniques in different fields and is currently undertaking such approach also for space surveillance. The use of standards is also a key aspect when several organisations around the world with different backgrounds and points of view are involved in the data exchange process. Consolidation of all those techniques and standards would be a big step forward in the common effort for safer space operations.

11:30 - 12:00 TBA

RESEARCH AND APPLICATIONS

13:00 - 13:30

Space Debris Hazardous Zones and Removal Methods.

Marshall H Kaplan, Space Department, Applied Physics Laboratory, Johns Hopkins University



At any moment there are several hundred operational satellites in just a few advantageous orbital zones in low Earth orbits (LEOs). Unfortunately, of the more than 20,500 objects being tracked by the Space Surveillance Network most are classified as debris. Furthermore, a majority of large and small debris objects reside in the same orbital zones as most active LEO satellites. Clearly, any serious program for debris removal should first address this highly congested orbital zone and method for removal of hazardous debris objects. If this region is left unattended debris will continue to propagate through collisions, launches, mishaps, explosions and expiration of active satellites. With each passing day the risk of damage to active LEO satellites increases. Eventually, a phenomenon called the Kessler Syndrome may lead to the

destruction of many or most operational satellites in low orbits. In fact, movement toward this phenomenon has already begun to take shape. On the average, debris numbers are increasing and average sizes are decreasing. At some point in the not-too-distant future, and in highly populated spherical shells about the Earth, there could be a chain reaction of collisions as the frequency of events accelerates exponentially. Once this process begins most active satellites in these congested orbits will rapidly be reduced to a cloud of particles that could act as a barrier to space flight, preventing penetration by satellites and launch vehicles. Should this situation occur, space access could be denied to all space-faring nations until this debris shield is at least partially cleaned up. The proposed paper addresses the regions of highest debris collision risks, critical early steps to debris reduction and methods of removing large and small debris objects.

13:30 - 14:00 Mitigation: Debris reduction by de-orbiting or exo-orbiting.



Mark Huebner, Independent Space Researcher

Satellite with radar/optical tracking for detection of objects for removal. Two modes of removal: a) laser ablation of front side from a distance by laser illumination of satellite-debris, with the intent to create a jet of material moving front-ward from the object and creating a slowing force on the object. b) landing on a larger object with subsequent clamping, then laser vaporization/ionizing of selected surfaces of the object and subsequently using RF-magnetic field acceleration of the ions for an ion propulsion system using the satellite-debris material for the ion-drive propulsion ejecta.

Additionally the satellite would require solar panels for power, a laser system of sufficient power, an ion-drive system capable of utilizing multiple ion types. The system would utilize solar energy for de-orbiting and manoeuvring. All fuel consumables would come from the satellite-debris to be de-orbited or exo-orbited sunward.

14:00 - 14:30 TBA

15:00 - 15:30 A modern, modular space catalog maintenance architecture.



Robert Hall, Technical Director, Analytical Graphics, Inc.

The challenge of ensuring safety of flight all for active satellite payloads has received international attention and heightened priority since the Iridium / Cosmos collision on 10 Feb 2009. The operational need of performing robust conjunction assessments on a larger set of primary satellites and secondary space objects is upon us. This paper presents an innovative approach for performing All-On-All conjunction assessment on the entire space catalog, followed by notification, analysis and avoidance manoeuvre planning. This robust process and capability is a foundational element in ensuring near-Earth space safety of flight.

The process developed and implemented uses an approach that divides the problem up in parallel chunks. The parallel approach provided the opportunity to leverage multiple processors available on a dual quad-core desktop PC (cost: \$3800 US), and utilizes a set of three filters, now available in our approach to be used with a high precision ephemerides version of the space catalog.

This approach has produced robust conjunction assessment results in terms of computational performance, automation, and capability. The authors will discuss the detailed approach and results for performing full catalog conjunction assessment along with a web services environment for processing and trending conjunctions, notifying operators and providing conjunction avoidance manoeuvre planning. The manoeuvre planning must take into account many factors, including fuel usage and potential deviations from the operational orbit. This work describes an analysis tool that can perform parametric studies of single and multi-axis manoeuvres. The object pair's positions, velocities, covariances, and physical sizes are imported from STK and the user can modify the covariances and physical object sizes. To reduce risk to an acceptable level, the user selects from a family of possible manoeuvres based on probability and miss distance. This manoeuvre is then fed back into STK for further system analysis.

15:30 - 16:00 Collision Avoidance Study for PicoSatellites Formation Flying Project.



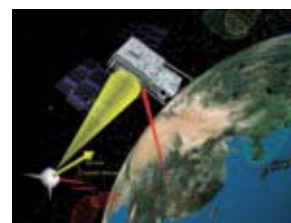
Rocco C Pellegrini, Postdoctoral researcher Italian Space Agency (ASI)

The aim of this paper is to present the activities that have been carried out in the frame of a student project for the realization of a flying formation in order to prevent and avoid collisions between them. A three element formation flying for low orbit mission was simulated. A double cubesat structure made by a chief cubesat and three picosat was designed. The three small picosats after a low orbit injection are released to reach a formation flying configuration. A spring releasing system for the two picosat was designed from the main structure to keep the final configuration.

Thanks to a cooperation with ASI it has been possible to use ASI CEF (Concurrent Engineering Facility) where students and ASI experts participated in two study sessions used to finalize the Phase A of the project. The concurrent engineering approach showed to be very useful to point out and solve problems in a quick and effective way.

16:00 - 16:30 National Security Space Office NSSO - TBA

16:30 - 17:00 Closing Remarks



Courtesy of AGI

Register by 27th January Early Bird Savings

For more information or to register online visit www.nearspacesecurity.com

"EXTRA - Collocated alongside NSS are two established conferences and exhibitions - Avionics Expo & Defence Electronics. Conference delegates booked for NSS can also choose to attend these sessions AT NO EXTRA COST. See sample sessions below or go to www.avionics-event.com for more details or the attached booking form overleaf."

WEDNESDAY 24TH MARCH 2010

Avionics with ATM (Air Traffic Management).

Chair: David Bowen, Head of Airborne and CNS Systems Unit, SEASAR, Belgium

SESAR IP1 Phase and Aircraft Systems Contribution.

Didier Delibes, Senior Manager, Airbus, France

FAA National Airspace System (NAS) Aircraft Architecture Planning.

Steven Van Tress, Chief Aircraft Architect, Federal Aviation Administration, USA

Performance Based Operations.

Chair: Lars Lindberg, President, AVTECH Sweden AB

Performance Based Navigation (PBN) in Europe.

Steve Duenkel, Senior Program Manager, Boeing Commercial Aviation Services, USA

Implementing RNP AR.

Paul-Franck Bijou, Airbus-Quovadis

How Performance Based Operations Reduced Operational Cost and Environmental Load at Global Anchor Points.

Lars Lindberg, President, AVTECH Sweden AB

Regulatory Frameworks for Performance Based ATM.

Paul Ravenhill, Technical Director, Helios, UK



**24th - 25th March 2010
Amsterdam, Netherlands**

THURSDAY 25TH MARCH 2010

Next Generation Military Avionics.

Chair: Eric Branyon/John McHale

Performance Based Conformity Assessment for Airborne Military Systems Integration in SESAR.

Dominique Colin, Standardisation and certification expert, Eurocontrol, Belgium

Head Up Display Performance Improvements through Advances in Optical Design.

Fraser McGibbon, BAE Systems

Unmanned Systems Avionics.

Chair: Alex Wilson, Senior Program Manager, Aerospace and Defence, Wind River, UK

Cost Efficient Avionics.

Chair: Pierre Magro, Head of Avionics Product Line, Airbus SAS, France

EFB Class 2 & 3 Strategy, Business Case and Development.

Yolanda Aguilar, Airbus

Class 1 to Class 2 EFB Transition and Advanced Applications.

Phil Moylan, Regional Marketing Representative, CMC Electronics- an Esterline company Simo Tauriainen, Avionics System manager, Finnish Commuter Airlines

The Complexities of Implementing an Integrated EFB Program - A Real World Case History.

Knut Aabo, Executive Vice President, Sales and Marketing, NavAero AB, Sweden

Fundamental Guidelines to Regulatory Approval for Paperless Cockpit and Paperless Maintenance.

John Corrigan, Skypaq

Runway Incursion & Excursion - Increasing Safety.

Chair: Rudolf Bracho, Boeing, USA

Surface Operations Safety.

J J Johnson, Manager, Flight Deck, Boeing Commercial Airplane, USA

Advanced Synthetic Vision for Rotocraft.

Andre Franks, Manager Avionics System Engineering, EADS Deutschland GmbH, Germany

Enhanced Surface Operations and Runway Overrun Prevention System.

Fabrice Villaume, Airbus

Degraded vision landing Aid.

Thomas Münsterer, EADS Deutschland GmbH

Register by 27th January Early Bird Savings

For more information or to register online visit www.nearspacesecurity.com

If booking online quote 'NSS2010' in the CODE box. You can also scan/email to abroadbent@nearspacesecurity.com



24th – 25th March 2010 | Amsterdam, Netherlands

To register, please complete the registration form below and return.

Specify sector of interest: ☐ Avionics ☐ Defence ☒ Space

First Name:
 Last Name:
 Position:
 Company:
 Complete Mailing Address:

 Postal code: Country:
 Telephone: (+) Fax: (+)
 E-mail:

Registration confirmation will be sent via e-mail, if unique e-mail address is provided above

Business/Industry

- ☐ Aftermarket Business
☐ Air Traffic Control
☐ Airlines & Operators
☐ Airport Operations
☐ Consultant
☐ Distributor
☐ Media/Press
☐ OEM Business
☐ Systems Integrator/Prime Contractor
☒ Space
☐ Component Manufacturer
☐ Government
☐ R&D
☐ Armed Forces

Job Function

- ☐ Consultant
☐ Government Official
☐ Operations
☐ Purchasing
☐ Systems Integration
☐ Corporate Management
☐ Engineering management
☐ Project Management
☐ Engineering
☐ Technical
☐ Sales & Marketing
☐ R&D
☐ Media/Press

Individual Full Conference

(Includes 2-day Conference, Conference Proceedings, Keynote, Exhibitor Presentations, Exhibition, Networking Reception, Coffee Breaks and Lunch)
☐ Paid before 27 Jan 2010 **€890**
☐ Paid on or after 27 Jan 2010 **€950**

Individual Day Delegate

☐ Individual Delegate (Single Day Registration) **€685**
(Includes access to Conference on the day, Exhibitor Presentations on the day, Exhibition on the day, Coffee Breaks on the day and Lunch on the day)
☐ Wednesday 24th ☐ Thursday 25th

Exhibitor Full Conference

(Includes 2-day Conference, Conference Proceedings, Keynote, Exhibition Presentations, Exhibition, Networking Reception, Coffee Breaks and Lunch)
☐ Exhibitor Full Conference **€475**
☐ Conference Proceedings Only **€100**

Corporate Plan

For 3 or more delegates, enjoy a 33% discount on each delegate place.
(Includes 2-day Conference, Keynote, Exhibitor Presentations, Exhibition, Networking Reception, Coffee Breaks and Lunch)
☐ a. Corporate Plan (Group of up to 3 Delegates) **€1900 (Save 20%)**
☐ b. Corporate Plan (Group of up to 6 Delegates) **€4575 (Save 20%)**
☐ c. Corporate Plan (Group of up to 9 Delegates) **€6650 (Save 20%)**

Association Full Conference

Please indicate the Association you are registering under
☐ NAG ☐ NIDV ☐ IET ☐ KTN

Exhibition Floor Only

☐ Exhibit Floor Visitor **FREE**

Master Classes

(includes access to selected Master Class only)

Wednesday 24th March 2010

10:30 - 14:45
☐ Maximising Avionics Software with Minimal headache:
 Legacy Upgrades and COTS Utilisation **€100**
14:30 - 17:00
☐ IMA – From Concept to Deployment using Qualified
 Development Tools and Operating Systems **€100**

Thursday 25th March 2010

09:30 - 12:00
☐ SSV: the Existing Answer to Reconfigurability Requirements
 of Next Generation IMA **€100**

Workshops

(includes access to selected Workshops only)

Wednesday 24th March 2010

10:30 - 11:30
☐ Changes and Solutions for Certifying C++ Object-Oriented
 Embedded Software Applications **€55**
11:30 - 12:30
☐ A Partitioned, Safety Critical Graphical Abstraction Layer **€55**
14:30 - 15:30
☐ Implementing an AFDX End System in Complex FPGA Logic
 – Objectives and Safety Considerations **€55**
16:00 - 17:30
☐ High Speed Databus COTS hardware

Thursday 25th March 2010

08:30 - 09:30
☐ Software Performance Optimisation: How to Avoid
 Early Obsolescence of Avionics Systems **€55**

09:30 - 10:30

☐ Software Safety and Security in the Context of Standards **€55**

11:30 - 12:30

☐ Evaluating the Benefits of today's Available DO-1788 Level A Certified
 COTS Software Products **€55**

14:30 - 15:30

☐ Required – Formal Methods for UAS Safety-Critical
 Software Development **€55**

16:00 - 17:00

☐ Insight: Assisting Aviation Display Designers by Measuring Visual Clutter **€55**

Method of Payment:

☐ Cheque enclosed (in Euro's ONLY)
☐ Wire (Wire information will be provided on invoice)
 Credit Card: ☐ Visa ☐ Mastercard ☐ AMEX ☐ Discover
 Please add all selections and total here: €
 Add 19% Dutch VAT: €
 TOTAL DUE: €
 Credit Card Number:
 Expiry Date: /
 Full Name (as it appears on card):
 Card Holder Signature:

Payment must be received prior to the conference. If payment is not received by the conference date, the registration fee must be guaranteed on charge card until proof of payment is provided. Make cheque payable to Energy Logistics International/Avionics 2010.

Cancellation of registration must be received in writing. Any individual, exhibitor or corporate registrations cancelled before 19 February 2010 will receive a 50% refund of registration fee. After 19 February 2010 no refunds will be permitted. Substitutions may be made at any time by contacting the registration office in writing.

Passenger Terminal Amsterdam (City Centre) • Amsterdam, Netherlands • www.nearspacesecurity.com

PRODUCT APPLICATIONS

SYSTEM VERIFICATION

MIPS accelerates processor IP verification with Mentor Graphics Veloce emulation system

MIPS Technologies, a microprocessor semiconductor IP company, needed a solution for system-level verification of its licensable microprocessor cores, which are used in a variety of embedded computing applications. They found the needed system at Mentor Graphics Corp., maker of high-performance system verification solutions in Wilsonville, Ore.

MIPS Technologies has adopted the Veloce platform from Mentor Graphics. MIPS cores are used by other Veloce platform users, including NXP Semiconductors, a supplier of digital SoCs (system on chips). MIPS Technologies chose the Veloce platform for its debug capabilities, performance, accuracy, and portfolio of iSolve vertical market solutions.

"MIPS has leveraged Veloce on several of our recent IP development projects—including the multi-threaded, multi-core 1004K Coherent Processing System—to



verify new cores before releasing them to customers," says Larry Hudepohl, vice president of engineering for MIPS Technologies. "We use Veloce extensively in an in-circuit emulation mode and for simulation acceleration. The Mentor emulation team helped us tremendously in making an easy transition to the Veloce platform from our previous systems."

The Veloce platform is a dual-mode accelerator/emulator, providing megahertz performance for transaction-based verification and traditional in-circuit emulation (ICE). Veloce is for multimedia, networking, wireless, and embedded systems applications.

"We have worked closely with MIPS Technologies for many years to provide

the best possible emulation solution that meets their needs and addresses the challenges the company faces in verifying processor designs," says Eric Seloisse, vice president and general manager, Mentor Emulation Division. "To support the large and growing base of MIPS licensees, we will soon announce new products supporting MIPS processor cores."

"NXP continues to drive system-level integration to provide advanced solutions to our customers," says Iqbal Sharif, general manager, SoC Design Centre of the home business unit, NXP Semiconductors. "Pre- and post-silicon testing of our SoCs requires a massive number of verification cycles to validate functionality and avoid design flaws. The use of Veloce for hardware-assisted verification has played an important role for NXP to achieve the high-speed verification and testing required. This ultimately enables us to beat our tight schedules in a highly-competitive market."

For more information, visit Mentor Graphics online at www.mentor.com.

UNMANNED VEHICLES

Military robots to be delivered to U.S. Army by iRobot in \$35.3 million contract

U.S. Army leaders needed military robots for unmanned ground vehicle applications. They found their solution from iRobot in Bedford, Mass.

The U.S. Army TACOM Contracting Center in Warren, Mich. awarded iRobot

a \$35.3 million order for 486 iRobot PackBot 510 unmanned vehicles with FasTac Kit robots, to be delivered by this spring. This unmanned ground vehicles order falls under the \$286 million xBot contract.

The PackBot 510 unmanned ground vehicle with FasTac Kit provides warfighters with the ability to see and assess dangerous areas from safe standoff distances and to clear routes while on the move. The military robot is controlled through a rugged laptop with game-style controller, operates at speeds as fast as 5.8 miles per hour and provides as much as four hours of mission run time.

"This order is truly a significant milestone for iRobot," says Joe Dyer, president of iRobot Government and Industrial Robots. "Not only is it the single largest order we have ever received from the military, but it also proves that there is strong and continuing support for our PackBot FasTac platform that was introduced just last year."

For more information, visit iRobot online at www.irobot.com.



ELECTRO-OPTICS

Army selects DRS infrared night-vision sensor for enhanced vision in armored vehicles

U.S. Army armored vehicles experts needed infrared night-vision capability for enhanced vision in combat vehicles. They found their infrared sensor solution from the DRS Technologies Reconnaissance, Surveillance & Target Acquisition (RSTA) business group in Parsippany, N.J.

DRS is one of two suppliers chosen for a \$1.9 billion contract from the U.S. Army Communications-Electronics Command (CECOM) at Fort Monmouth, N.J., for Driver's Vision Enhancers (DVEs) with night-vision optics for the Army, as well as the U.S. Navy, Marine Corps, Air Force, and Special Operations Command. BAE Systems is the other DVE supplier.

DVEs provide operators of combat and tactical vehicles with military night-vision capability to maneuver in smoke, fog, sand, and other battlefield obscurants, using advanced infrared-imaging and rugged display technologies for synthetic vision.

"In 2004, we were awarded our first

DVE contract. Since then, we have delivered more than 40,000 units for deployment on a range of combat and tactical wheeled vehicles, including the Abrams tank and Bradley Fighting Vehicle, Stryker, MRAP, Amphibious Assault Vehicle, HMMWV, and other heavy and medium tactical wheeled vehicles," says Terry Murphy, president of DRS Technologies' Reconnaissance, Surveillance & Target Acquisition (RSTA) business group.

DRS officials say they expect to deliver four DVE versions: the DVE Lite for line-haul truck and tactical vehicle application to promote vehicle safety and hazard avoidance in supply chain operations; the DVE CV for combat vehicles; the DVE TWV with Electronic Pan and Tilt Modules (EPTMs) for tactical wheeled vehicles; and the DVE TWV with Forward Activity Detection System (FADS), for detection or surveillance at distances to monitor suspicious activities such as those associated with planting potentially deadly improvised explosive devices (IEDs).

For more information, visit DRS RSTA online at www.drs.com.

TACTICAL COMPUTING

Northrop Grumman Hunter unmanned aircraft system employs Parvus mission computers

Officials with Melhcorp LLC, a designer and integrator of embedded systems, electronic payloads, and sensor modules for severe environments in Slidell, La., sought sturdy mission computers for Northrop Grumman's MQ-5B Hunter unmanned aircraft system (UAS). They found their solution at Parvus Corp. in Salt Lake City, Utah.

Parvus has delivered more than 40 of its DuraCOR 810 mission computers to subcontractor Melhcorp. The subsystems have been configured to operate as the payload interface unit for the Hunter unmanned aerial vehicle. The DuraCOR 810 units monitor, control, and communicate between payloads onboard the Hunter, and control the mounted payloads, which include electronics and sensors.

Currently being deployed by the U.S. Army, the MQ-5B Hunter UAS conducts battlefield surveillance using its multimission electro-optical payload. Flying over the battlefield, it gathers reconnaissance, surveillance, target acquisition, and battle damage information in real time. The Hunter then relays this information via video link to



commanders and soldiers on the ground.

Melhcorp chose the Parvus DuraCOR 810 for the Hunter program because of its rugged modularity and MIL-STD-810F environmental compliance for extreme temperatures, shock/vibration, and ingress. This commercial off-the-shelf (COTS) tactical computer server integrates a low-power Intel Pentium M CPU together with a MIL-STD-704/1275 power supply in a rugged aluminum chassis with MIL-DTL-38999 connectors. Up to 6 spare PC/104(+) slots are available for integrators or Parvus to integrate mission-specific I/O (input/output) functionality.

"The rugged design of the DuraCOR 810 from Parvus fulfills my operational requirements and the fact that these systems can endure the harshest environment make the unit a perfect fit for the Hunter UASs," says Julio Melhado, president of Melhcorp. "By working with the Parvus Duracor 810, Melhcorp is helping deliver durable, reliable interface units for the Hunter UAS program."

"The selection of the Parvus DuraCOR 810 for the Hunter UAS is a testament to Parvus' proven track record of supplying highly-reliable, small form factor computing solutions for unmanned vehicle and other demanding military and aerospace applications," notes Les Goodman, president of Parvus.

For more information, visit Parvus Corp. online at www.parvus.com.

ELECTRO-OPTICS

FLIR Systems gains \$4.9 million Colombian military order for electro-optics

Officials in the Colombian Ministry of Defense needed infrared electro-optics to support airborne day and night counter-narcotic and counter-insurgency missions. They found their solution at FLIR Systems Inc. in Wilsonville, Ore.

FLIR Systems won a \$4.9 million U.S.

Government Foreign Military Sale (FMS) order for the Colombian Army and Air Force. The order includes FLIR Systems' Star SAFIRE III infrared multi-sensor surveillance systems, training, and related services.

The electro-optic units delivered under this award will be installed on rotary wing surveillance and tactical platforms in support of Colombian Ministry of Defense airborne missions.

Work on this order will be performed at FLIR's facility in Wilsonville, Ore. Deliveries are expected to be completed this year.

"This order demonstrates FLIR's presence in Colombia and Latin America, as we have now fielded more than 240 multi-sensor systems in the region," says Earl R. Lewis, president and CEO of FLIR Systems. "We are pleased to be selected once again by the Colombian Ministry of Defense for their life saving counter-narcotic and counter-terror missions."

For more information, visit FLIR Systems Inc. online at www.flir.com.

SIMULATION AND TRAINING

OSI Geospatial to deliver counter-IED training solution to Defence Research and Development Canada

Personnel with Defence Research and Development Canada (DRDC), an agency of the Canadian Department of National Defense, needed a training solution to enhance the ability of the Canadian Forces to recognize, react to, and defeat situations in which an improvised explosive device (IED) danger exists. They found their needed solution at OSI Geospatial Inc. (OSI) in Ottawa, Ontario, Canada.

OSI won a contract valued at roughly \$600,000 to deliver a prototype Counter-IED Immersive Training Environment (CIITE) system using the company's iGEN Cognitive Synthetic Agents.

"This is our first research-and-development contract with DRDC. We have already developed a similar solution for U.S. Marine Corps and feedback from this customer has been very positive," says Ken Kirkpatrick, president and CEO of OSI Geospatial.

CIITE is designed to provide an immersive environment in which trainees will learn how to recognize IEDs, communicate, and work together as a team with synthetic agents.

For additional information, visit OSI Geospatial Inc. online at www.osigeospatial.com.

NEW PRODUCTS

To submit new products for consideration, contact John Keller by e-mail at jkeller@pennwell.com

» DATA BUSES AND NETWORKING

TEWS introduces FPGA-based, high-speed synchronous/asynchronous serial interface

TEWS Technologies in Halstenbek, Germany, is introducing a synchronous/asynchronous serial single width/mid-height AMC.1-compliant module with four high-speed communication



channels. The TAMC863 is designed for data communications, LAN/WAN networking, military communications, traffic control, simulation, and telecommunications applications. The serial communication controller is implemented in FPGA logic, combined with the bus master capable PCI interface. The FPGA design delivers long-term availability with the option to implement additional application-specific functions. Several serial communication protocols are supported by each channel, such as asynchronous, isochronous, synchronous, and HDLC mode. In addition, a maximum data rate of 10 megabits per second is provided for synchronous protocols and 2 megabits per second is supported for asynchronous protocols. Multiprotocol transceivers are used for the line interface. The physical interface of each channel can be independently software selected for EIA-232, EIA-422, EIA-449, EIA-530, EIA-530A, V.35, V.36, or X.21. The TAMC863 features receive and transmit FIFOs of 512 long words (32 bit) per channel. Data transfer on the PCI bus is handled via TAMC863 initiated DMA cycles with minimum host/CPU intervention. In addition, several interrupt sources can generate interrupts on INTA for each channel, and interrupts may be enabled or disabled separately. Asynchronous and basic synchronous support for major operating systems, such as Windows, Linux, VxWorks,

and QNX is available. The TAMC863 operates in extended temperature range of -40 to 85 degrees Celsius. For more information, visit TEWS Technologies online at www.tews.com.

» POWER ELECTRONICS

Power management converter transformers introduced by Murata Power

Murata Power Solutions Inc. in Mansfield, Mass., is introducing a series of converter transformers for use in power management with the Analog Devices ADM2482/7 transceiver chipsets for isolated RS-485 and RS-422 interfaces. The Murata 782482 series power electronics device has controlled turns ratios to ensure consistent performance, while a toroidal construction helps minimize electromagnetic interference (EMI). Housed in an industry-standard, dual-inline package using UL94 V-0 materials, the 782482 measures 0.339 by 0.360 by 0.25 inches. Nominal input voltages are 3.3 volts for the 782482/33VC and 5 volts for the 782482/53VC; both models have a nominal output voltage of 3.3 volts and provide 4 kilovolts DC isolation. The series has an industrial temperature range of -40 to 85 degrees Celsius. Both models are RoHS-compliant and backward compatible



with tin-lead soldering systems. Surface-mount versions of the converter transformers are under development. The Analog Devices ADM2482/7 are suitable for high speed, half-duplex, or full-duplex communication on multipoint transmission lines. The devices employ the Analog Devices iCoupler technology to combine a three-channel isolator, a three-state differential line driver, and a differential

input receiver into one package. For more information, visit Murata Power online at www.murata-ps.com.

» POWER ELECTRONICS

Power management transformer for VME-based applications introduced by Beta Transformer

Beta Transformer Technology Corp. in Bohemia, N.Y., is introducing the DSS-3305 small-footprint dual channel transformer power management technology for 5-volt MIL-STD-1553 transceivers on VME boards. The DSS-3305 power electronics device satisfies the maximum VME height limit of 0.185 inches. This dual ratio transformer enables board layouts to accommodate transformer- and direct-coupled applications, meets MIL-PRF-21038, and operates over temperatures



from -55 to 130 degrees Celsius. Transformer-coupled applications involve a turns ratio of 1:1.79, while direct-coupled applications involve a turns ratio of 1:2.5. For more information, visit Beta Transformer Technology online at www.bttc-beta.com.

» RAD-HARD ICs

Rad-hard semiconductors that resist space radiation in space electronics offered by Rochester

Rochester Electronics, a source for discontinued semiconductors for aerospace and defense applications, is expanding its inventory and manufacturing capabilities for space-qualified semiconductors that resist the effects of space radiation. Rochester is manufacturing radiation-hardened (rad-hard) devices for space electronics that meet guidelines of the MIL-PRF-38535 standard for integrated circuits manufacturing, administered by the U.S. Defense Electronics Center Columbus (DSCC) in Columbus, Ohio,



and is a member of the DSCC Class V Qualified Manufacturing List (QML). Rochester is building 300 space-level logic devices acquired from National Semiconductor. Rochester also is authorized to manufacture rad-hard processor technology, and will acquire and manufacture space-level linear products in the near future, company officials say. Rochester also provides discontinued rad-hard and other semiconductor products from National Semiconductor, Texas Instruments, Fairchild Semiconductor, and other chip

manufacturers. The company also is developing rad-hard testing capabilities. For more information, visit Rochester Electronics online at www.rocelec.com.

» EMBEDDED COMPUTING

Themis introduces CoolShell high-performance rugged blade server

Themis Computer in Fremont, Calif., is introducing CoolShell rugged server technology, which combines a high-performance, single-board computer and graphics processor in a blade server configuration for rugged systems applications in demanding environments. The CoolShell blade servers use commercial CPU boards in rugged packages that provide electronics cooling and thermal management. The system is stable and stiff, with air flow paths, heat exchangers, and impeller assembly combined in a one field-replaceable unit. Themis' CoolShell

embedded blade server technology combines network connectivity of as many as eight optical or copper ports and cabling, with front-panel access for all active components. Independent controller channels of copper and fiber Gigabit Ethernet controllers provide network and I/O security. The CoolShell CS-3U is a modular commercial blade server system that packs processing, memory, and I/O into 17.75-inch-deep 3U rack. All modules are replaceable from the front, and all cable connections are on the front panels. The CoolShell CS-3U, which fits in a standard 19-inch rack, includes five replaceable modules; a dual socket processor blade, an I/O module that accommodates as many



WIDE INPUT WIDE SELECTION

Vicor Delivers 8 NEW 28 V Wide-Input, High-Density DC-DC Converters



The 28 V Micro DC-DC converter modules are targeted for either 12 V or 24 V applications such as MIL-COTS or commercial battery systems in vehicles or aircraft.

Nominal output voltages range from 3.3 to 48 Vdc with a maximum power of 100 W

- 50 W at 3.3 & 5 Vout
- 100 W at 12, 15, 24, 28, 36, & 48 Vout

Also, Vicor's 28 V Micro family has a wide trim range of 10 – 100% of nominal output voltage.

Learn More & Receive Something Extra

Access Vicor's NEW 28 V data sheet and qualify for a **laser pointer pen light!**
Go to vicorpower.com/28V. Or call 800-735-6200.



» NEW PRODUCTS

as three double-high PCI Express controller cards, network interface controller module, and two power supply modules. Key CoolShell CS-3U features include one or two Intel Quad-Core Xeon 5440 series processors; as much as 64 gigabytes of memory; three dual-headed graphical processing units; SATA hard disk drive as large as 1 terabyte, with options for five additional 2.5-inch solid state drives; eight copper Gigabit Ethernet ports (RJ45); ability to withstand shock and vibration as strong as 25 Gs and 10 to 2,000 Hertz; meets MIL-STD-901D, 810, and 167; operating temperature as high as 50 degrees Celsius; resistance to dust, dirt, and electromagnetic interference; and Linux, Windows, and Solaris X86 operating system support. For more, visit Themis Computer online at www.themis.com.

» DATA STORAGE

Serial FPDP data recorder for sensor processing introduced by Curtiss-Wright

Curtiss-Wright Controls Electronic Systems in Dayton, Ohio, is introducing the Vortex SDRxL off-the-shelf, four-channel Serial FPDP (sFPDP) data recorder for sensor processing streaming data applications in demanding environments. The Vortex SDRxL combines a 3U rackmount controller with a scalable storage subsystem. This data logger can record and store as many as four channels of sFPDP data at rates as fast as 960 megabytes per second for instrumentation recording, mission recording, and SIGINT/ELINT recording, and storage applications. The Vortex SDRxL is designed to enable high-



volume, continuous streaming data recording from sensors, such as radar, sonar, FLIR, RF tuners, MRI, and cameras. To simplify control is the Vortex Graphical User Interface (GUI). Time-Stamp For Playback of Critical Data Vortex SDRxL data recorders include the RapidReplay hardware system. For more, visit www.cwcmbedded.com.

» PRODUCT & LITERATURE SHOWCASE

DISCOVER THE SWITCHERS THAT HANDLE ANALOG & DIGITAL VIDEO

LINX™ CROSS X FORMAT™ SWITCHERS

HDMI™, DVI, RGB or component on every input

Internal conversion of analog signals

HDCP, Deep Color, embedded audio

Advanced EDID management, pin power & cable equalization

Available in three chassis sizes up to 32 x 32



SPECTRUM®
visual resource management™

Call us at (510) 814-7000 Visit our website at www.rgb.com

PRODUCT & LITERATURE SHOWCASE



ST-9020 rugged computer system with 20" display, MIL STD shock & vibration qualified



DU-19/U rugged monitor

For full line of rugged systems contact:

IBI SYSTEMS, INC.
6842 NW 20TH AVE, FORT LAUDERDALE, FL 33309
PHONE: 954-978-9225, WEB: www.ibi-systems.com

DATA STORAGE TECHNOLOGY

RPC12 Ruggedized 3U Fibre Channel RAID System

Phoenix International designs and builds rugged COTS Data Storage Systems that plug and play in any application -- from Multi-Terabyte Fibre Channel RAID and Storage Area Network configurations to plug-in Solid State Disk Drive VME/cPCI Storage Modules.

Low Operational Temperature -20° C

High Operational Temperature +60° C

Operational Altitude to 45,000 feet

Operational Temperature -20° to +60° C

Redundant, hot swap components/FRU's

40Hz to 440Hz, 90/240 VAC Input Operation

PHOENIX INTERNATIONAL

See us at: www.phoenixint.com or contact us at: 714-283-4800 • info@phoenixint.com
An AS 9100 / ISO 9001: 2000 Certified Service Disabled Veteran Owned Small Business

We Put the State of the Art to Work™

ADVERTISERS INDEX

ADVERTISER	PAGE
AEROFLEX COLORADO SPRINGS	13
AEROFLEX PLAINVIEW	23
AEROSPACE MEDIA	36-41
AP LABS	8
DATA DEVICE CORPORATION	C4
DRS TECHNOLOGIES	1, 20
FISCHER CONNECTORS HOLDING SA	29
FLIR SYSTEMS, INC.	17
GENERAL DYNAMICS C4SYSTEMS	31
IBI SYSTEMS, INC.	47
INTERNATIONAL RECTIFIER	3
ISI/NALLATECH	28
M.S. KENNEDY CORPORATION	26
MARTEK POWER ABBOTT, INC.	11
MERCURY COMPUTER SYSTEMS	2
OMNETICS CONNECTOR CORP	10
PHOENIX INTERNATIONAL	47
PICO ELECTRONICS, INC.	9, 14
RGB SPECTRUM	46
SYNQOR	31
TEWS TECHNOLOGIES	47
THEMIS COMPUTER	7
VICOR CORPORATION-BRICK BUSINESS UNIT	C2, 5, 45
VPT INC.	12

www.milaero.com

COTS I/O Solutions for:

IndustryPack®, PMC, CompactPCI, PCI with Outstanding Software Support.

- CPU Carriers
- IP and PMC Carriers
- Ethernet
- Communication
- CAN Bus
- Field Bus
- Digital I/O
- Analog I/O
- PC Card/CardBus
- Motion Control
- Memory
- User-programmable FPGA

VxWorks

Linux

Windows

LynxOS

QNX

TEWS TECHNOLOGIES

www.tews.com

TEWS TECHNOLOGIES LLC: 9190 Double Diamond Parkway, Suite 127 • Reno, NV 89521/USA
Phone: +1 (775) 850 5830 • Fax: +1 (775) 201 0347 • E-mail: usasales@tews.com

TEWS TECHNOLOGIES GmbH: Am Bahnhof 7 • 25469 Halstenbek/Germany
Phone: +49 (0)4101-4058-0 • Fax: +49 (0)4101-4058-19 • E-mail: info@tews.com

© 2009 TEWS TECHNOLOGIES GmbH, all rights reserved. All trademarks mentioned are property of their respective owners.

MILITARY & AEROSPACE ELECTRONICS | February 2010 | 47

MILAERO.COM

Military & Aerospace Electronics

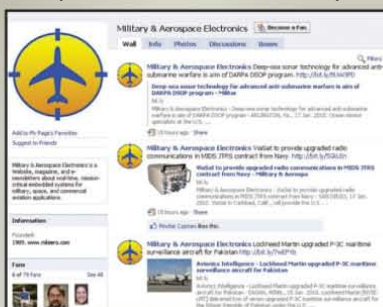
Best of the Web

Community Forum | New Video | Webcasts | Archive | White Papers | Events | Industry News Flash | Blog

GO MILAERO BLOG

E-networking revolution highlighted 2009

At *Military & Aerospace Electronics* in 2009, we dived right into social networking or as we like to call it, e-networking. We have a fan page on Facebook, a group on LinkedIn called the PennWell Aerospace and Defense Media Group,



and gather our news content on Twitter under #milaero and avionics content on #avintel. It's been a fun and successful way to push out our online news stories to new readers and start discussions. We've found the most interactive outlet to be on LinkedIn, which started out as a professional networking site whereas Facebook was focused on more social or personal networking.

more www.pennwellblogs.com/mae

DEFENSE EXECUTIVE

ITT to consolidate seven defense business segments into three new operating units

Executives of ITT Corp. in White Plains, N.Y., are consolidating seven of the company's defense business segments into three new operating units. The company's defense segment will be renamed ITT Defense and Information Solutions, and its existing seven separate business segments will consolidate into three large units. "We are positioning ITT to support our customers' emerging technology needs, while also greatly enhancing our ability to stake out markets," says Steve Loranger, ITT's chairman, president, and CEO. "We believe this move will also allow ITT to achieve greater operating efficiencies and optimize our cost structure, which will help drive business strategies for continued growth."

more www.milaero.com

AVIONICS INTELLIGENCE

Boeing 787 Dreamliner completes first flight

The Boeing 787 Dreamliner made its first flight from Paine Field in Everett, Wash. The flight marks the beginning of a flight test program that will see six airplanes flying nearly around the clock and around the globe, with the airplane's first delivery scheduled for fourth quarter 2010. Boeing 787 Chief Pilot Mike Carriker and Capt. Randy Neville tested some of the airplane systems and structures, as on-board equipment recorded and transmitted real-time data to a flight-test team at Boeing Field.



more www.avionics-intelligence.com

GO COMMAND POST COMMUNITY

Automating compliance to MISRA C/C++ standards

Thanks to their inherent flexibility and potential for portability across a wide range of hardware, C and C++ have become the languages of choice for the development of real-time embedded applications. C and C++ have most of the features a software

development team could wish for and, in the right hands, can be used to write well laid out, structured, and expressive code. In the wrong hands, this flexibility can lead to perverse and extremely hard to understand code. The Motor Industry Software Reliability Association (MISRA) has done much to promote best practice guidelines for the C, and now C++, languages. In

1998, MISRA published their C standard to promote the use of "safe C" in the UK automotive industry, which was updated and re-released as MISRA-C:2004. Widely accepted as a "safe-subset" for use in the C language, the MISRA guidelines draw from a variety of sources, but in particular address the issues highlighted in the ISO standard regarding unspecified, undefined, and implementation-defined behavior.

more <http://community.milaero.com>

INNOVATE

FOR TOMORROW

Military & Aerospace Electronics Forum
The Conference and Expo for Innovation in Defense Applications

June 3-4, 2010

San Diego Convention Center

San Diego, CA

With new technology developments on the forefront of the future, now is the time to participate in Military & Aerospace Electronics Forum, the world's leading event for the military aerospace industry. Co-located with Avionics USA Conference & Exhibition, the Military & Aerospace Electronics Forum covers next-generation technologies for defense avionics, vetronics, shipboard, radar, sonar, and other mission critical applications.

In two fast-track days of networking, attendees benefit from:

- Technical conference sessions including master class offerings
- Exhibit floor showcasing dozens of companies providing products and services to the industry
- Focused workshops providing in-depth coverage of industry hot topics
- Opportunities to see the latest technologies and solutions available to the market

Visit www.milaeroforum.com for 2010 event details and updates.

Flagship Media Sponsor:

Military & Aerospace Electronics

Owned & Produced by:

PennWell

Co-located with:

avionics usa



The Highest Quality, Most Reliable, Field Proven Technology... for your Mission Critical Systems



INTRODUCING THE **WORLD'S 1ST...**

fully integrated MIL-STD-1553 terminal and transformer solution
in a single package.



Total-ACE™

- Small package (1.1 in x 0.6 in) saves board space
- Simplified board design and less cost with single package system
- Field proven technology with 62 million hours of in-service history

Visit: www.ddc-web.com/TACE/MA



The first choice for more than 45 years — DDC

DDC is the *world leader* in the design and manufacture of high reliability data bus products, motion control, and solid-state power controllers for aerospace, defense, and industrial automation.

CARDS
COMPONENTS
SOFTWARE

